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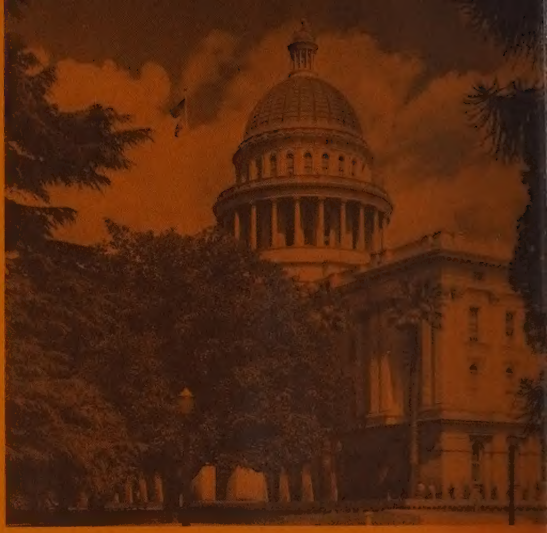

CALIFORNIA STATE BOARD OF AGRICULTURE

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OUR COVER: In 1957 California produced over 9 percent of the Nation's honey crop and ranked first in the Nation as a honey producing state. See page 250. In order to help preserve this standing, California is constantly on the lookout for diseases which effect the honey bee. See page 215.

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Acarine Disease of Honey Bees

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Introduction

People often react with surprise when they learn that honey bees have diseases as do our domesticated animals. These bee diseases, though they do not affect honey for human consumption, cause serious losses to beekeepers by reducing the strength and productivity of their honey bee colonies. Most of the known diseases are present in California and the rest of the United States, but we have been spared one of the most serious ones known as acarine disease. It is caused by a tiny parasitic mite, *Acarapis woodi* (Rennie), which infests the tracheae, or breathing tubes, of adult bees causing them to lose the power of flight and eventually killing them. Infested colonies are reduced in size, and usually die over the winter unless some control measures are taken. The mite is now present in Europe, Asia and South America, but is not yet present in North America.

Shortly after the original discovery of the mite, federal legislation, known as the Honeybee Act of 1922, was enacted to restrict the importation of adult honey bees, and thereby to prevent the introduction of *A. woodi* into the United States. This act prohibits the importation of bees from all countries not known to be free of the mite. The only country so far excepted is Canada. The U. S. Department of Agriculture, with adequate safeguards, may import bees for experimental or scientific purposes.

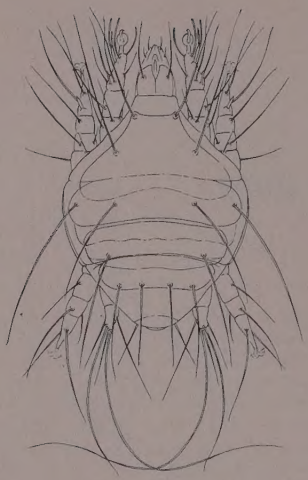
In this age of increasingly rapid intercontinental transportation, the possibility of introduction of the acarine mite is very real. An undetected queen bee in a cage with her attendants, carried in a pocket by anyone interested in bees, could be the means of introduction. To cope with any such infestation, we need a tentative plan for the action which would be necessary to eradicate the mite as quickly as possible. Our Bureau of Entomology has such control plans on file for controlling several other serious insect pests which are established in other countries and other states, but not yet established in California. Pink bollworm, oriental fruit fly and European corn borer control plans are outlined, with details on surveys, quarantines and chemical, cultural and biological control methods. Also included are such items as the manpower necessary, individual duties, equipment, materials, forms and budgets.

In order for us to make such a plan for the acarine mite we need to know as much as possible about its biology and control. Let us consider first some of the background information about *Acarapis woodi.*

THE MITE, ACARAPIS WOODI

Historical Background

In 1904 serious losses of adult bees were found in apiaries on the Isle of Wight. The reason for the death of the bees could not be found, and the malady spread rapidly throughout the British Isles. Two years after the losses were first noticed on the Isle of Wight, 90 percent of the colonies had died (4). In Oxford County, England, 80 percent of the colonies had died, and other areas were equally hard hit. In 1920, Dr. John Rennie and his associates at Marischal College in Scotland discovered the parasitic mite present in the breathing tubes or tracheae, of affected bees, and placed it in the genus *Tarsonemus* (19). Hirst (10) placed it in a new genus, and gave it the name *Acarapis* by which we now know it. Losses from the mite are not so high now as when it was first discovered, but as recently as 1943-44 a survey by the Bee Department of Rothamsted Experimental Station, England, found 17.3 percent of the colonies infested in England and Wales (8).



Adult Female

Adult female mite. After Hirst (10).

Identification

Rennie (17) gave a good general rule that any mite visible to the naked eye, associated with bees or not, is not *Acarapis woodi*. Some of the other mites found associated with bees can be seen very easily. The females of *A. woodi* are from four-thousandths to seven-thousandths of an inch long (.004-.007 in.) and males from three-thousandths to five-thousandths of an inch (.003-.005 in.) (7). One of the important identifying characters seen in Figure 1 is the long whip-like setae, or hairs, found on the end of the fourth pair of legs on the female mite (1). The eggs are unusually large, often exceeding the size of the adult male mite. Primary identification of the presence of the mites is made by observation of the symptoms present in the trachea. Identification of the mite itself is best done by a specialist.

Life History and Dissemination

A typical infestation begins with a young female mite which has mated, and which has left the trachea of its original host bee. The mite crawls out on a hair, where it assumes the "ambush" position with forelegs extended waiting to make contact with another bee. If no contact is made, the mite usually dies within 24 hours (9). If it is able to grasp a thoracic hair of another bee, it moves down the hair and migrates toward the first thoracic spiracle, apparently in response to the intermittent air current out of the spiracle (20). Mites are not able to migrate very far, and may die without reaching a spiracle if they land on the head or abdomen.

The new host bee must be less than five or six days old, or the female mite will be unable to pass through the hairs surrounding the spiracle (8). Once inside, she feeds through the tracheal wall and lays her eggs very close to the spiracle. About 5 to 10 eggs are laid. These hatch into larvae, and become adults in a total of 9 to 15 days (7). As the number of mites increases, they migrate as far into the trachea as their size allows. After mating, some of the females remain to lay eggs; the others leave the trachea to find new hosts (16). The mites breed and migrate all year. During the broodless period there are no young bees to become infested, but some of the mites are able to live on the old bees by feeding at the bases of the wings (20).

Fortunately for the beekeeper, the mites are spread only from bee to bee. It is not necessary to destroy combs or hives which have contained infested bees. Under controlled experimental conditions, mites usually die in less than 24 hours when removed from their host bee. They can apparently live 24 to 30 hours on dead bees, and have been found alive in tracheae of bees dead for five days (18).

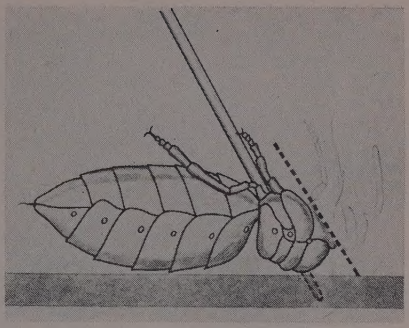
The usual means of spread of mites are: [1] drifting of workers and drones between colonies, [2] robbing, [3] transferring bees, [4] sale of bees, and [5] swarming. The most serious of these is robbing, which is the stealing of the honey from a weak colony by the bees from a stronger colony (2). Colonies heavily infested by mites become weak and therefore subject to robbing. The colony doing the robbing can become heavily infested very quickly.

Effects on Infested Bees, Diagnosis

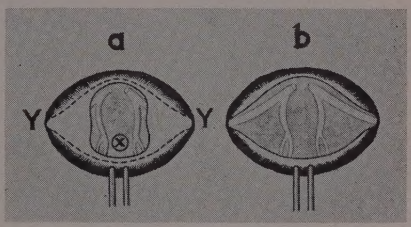
The invasion of the tracheae by the mites shortens the life of the infested bee, and gradually weakens it so that it can no longer fly. This development causes many bees to die in the field. Many others are found crawling in front of the hive, unable to fly, especially after a period of confine-

ment to the hive. The weakening of the bee is believed due to loss of blood, reduction of the amount of air received by the tissues, deterioration of tissues around the tracheae, and possibly some toxic effect of the mite on its host. Workers, queens and drones are all invaded by the mites. Rennie (14) found the queens infested in 50 percent of the infested colonies he examined. He believed that workers were damaged more than queens because of their more active life, and subjection to wider ranges of temperature and other environmental conditions.

To examine an individual bee, remove the head and first pair of legs under a dissecting microscope, as illustrated in Figure 2. These pull away easily from the body, leaving an opening, as in Figure 3a, through which the first pair of thoracic tracheae can be seen. Next, with a fine pair of forceps, remove the "collar" surrounding the hole in the thorax so that the tracheae are exposed down to their connection with the spiracles as in Figure 3b. Figure 4 illustrates the appearance of uninfested tracheae which are a glistening white color. Light infestations will appear as translucent areas, usually near the spiracles. The tracheae in older infestations, shown in Figures 5 and 6, are spotted with bronze or black areas, or entirely black in very heavy infestations. One or both tracheae may be infested.



Removal of head and forelegs.



Anterior (front) view of thorax, before (a) and after (b) removal of the "collar."

Effects on Colony, Diagnosis

The course of the infestation in a colony is dependent upon several variables, including the size of the colony, the time of year of the initial infestation, brood production, and number of bees initially infested (15). The presence of the mite does not inevitably cause the death of the colony. The rate of reproduction and spread of the mite may be slower than the increase, and changes in makeup, of the population of a strong colony during the spring and summer. The colony may then overcome the infestation. This situation is most likely when only one or a few bees are initially infested. If large numbers become infested through robbing, the colony may be quickly weakened and killed. The disease is most virulent when it reaches a new area, gradually decreasing as the most susceptible colonies are killed (4).

Honey yields from infested colonies are reduced because of the shortened lives, and continual loss, of workers harboring the mites. Unless controls are used, colonies infested in the fall will usually die during the winter.

Detection of the presence of *Acarapis woodi* in colonies, and its subsequent control, is made more difficult by the time interval between the initial infestation and its visible effect on the colony. This time may be weeks or even months before crawling bees can be seen in front of the hives. They are found in large numbers most often in the autumn or spring, after being confined to the hive by the weather. Since these bees are unable to fly, their abdomens may be distended, and their wings may be dislocated at an abnormal angle. Examination of the thoracic tracheae of the crawling bees must be used to make a positive diagnosis because other colony conditions may produce similar symptoms.

Worldwide Distribution

The acarine mite has been reported present throughout the British Isles and in many European countries, including France, Belgium, Germany, Switzerland, Italy, Poland and others. It has not been found in many of the other countries, including Denmark and Greece.

In the western hemisphere, infestations have been reported from Argentina and Uruguay where it was found in 1953 (3).

The most recently discovered infestation was reported from India in 1956, affecting large numbers of bees and colonies (13). This is apparently the only infestation involving the small honey bee, *Apis indica*. All others affect *Apis mellifera*.

CONTROLS

More progress has been made in controlling and eradicating *Acarapis* in the last five years than in the other 33 years since its identification. The results should give us hope that if an infestation is found in the United States, it can be eradicated if detected in time. Before discussing the latest materials and methods, let us review the different types of controls possible and some of the results obtained.

Biological Control

One biological control method has been attempted in France using a yeast, *Acaromyces*, discovered attacking mites inside the tracheae (12). Good results were reported by spraying the combs of colonies with a suspension of the yeast. Such a control would be of value in long-established infestations in conjunction with other methods, but would be of little value where eradication is essential.

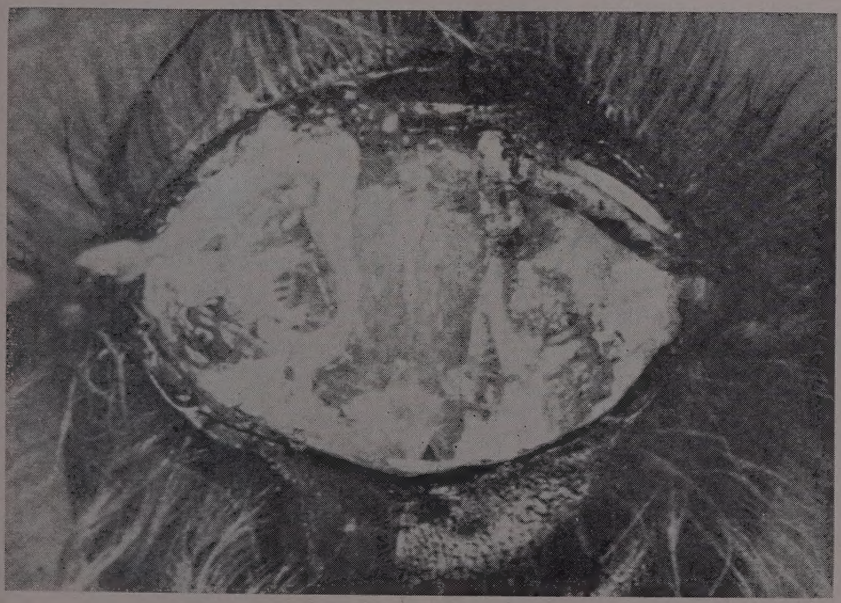
Cultural Control

Like the previous method, cultural controls are of value in widespread infestations where eradication is not being considered. Two methods are being used. In the first, brood *without adult bees* is moved from infested colonies to a new apiary established with mite-free nuclei, or small colonies. As the infested colonies are reduced in size by the removal of their sealed brood, they are united, and eventually all adult bees are killed. This method of control was used successfully in Germany on 1,400 colonies over a period of four months (11).

The other type of cultural control is the use of bees which show some resistance to the mites. The resistance allows infested colonies to produce more honey but, since the bees are not immune, they support an infestation, and also spread it.

Uninfested tracheae.

One infested tracheae (right).



Both tracheae infested.

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Chemical Control

Chemical control appears to be our greatest hope if we ever have to eradicate *Acarapis woodi* in the United States. Two approaches can be used in research to make the task simpler. One is to find a systemic acaricide which can be fed to infested colonies to kill the mites without killing the bees. A few old remedies, like mustard oil, colloidal sulfur and terpineol, have been tried as systemics without success (11).

The other approach, in which the most progress has been made, involves airborne control agents such as vapors, dusts, aerosols and smokes. The old traditional materials of this type, such as safrol, nitrobenzene, mustard oil, methyl salicylate, hydrochloric acid and sulfur smoke, have sometimes given good controls. However, they often damaged the colonies, subjected them to robbing, and several could be used only during the winter months. Recent research has shown that they are usually more effective for killing bees than mites (11).

Three new acaricides appear to be effective enough to eradicate *Acarapis* when used in conjunction with other control measures. The materials are Chlorobenzilate (Folbex), Dimite (P. K.) and Ovotran. They are used by soaking blotting paper first in 5 percent potassium nitrate solution, and then, after drying, in a 15 percent solution of acaricide. A strip of the paper about 4 1/4 inches by 1 9/16 inches then contains one dose of 350-450 mg. One pound of acaricide will make from 900 to 1,350 doses (or strips). A dose is administered by placing a lighted strip either in an empty super above the colony or on the bottom board beneath the frames. This is done in the evening, and the hive entrance is closed over night. Two treatments of one dose each, a week apart, eliminated infestations in England under the climatic conditions prevailing in late July. Results were better at 55-70° F. than at 40-60° F., probably because the acaricide gets into the cluster and into individual bees better at the higher temperature. Adult bees were killed in hives treated during "very hot weather" (temperature not given) (5).

Problems in Control and Eradication

If we are ever faced with an infestation of acarine mites our success in controlling and eradicating it will depend upon how well we meet the problems involved. The primary one is that of detecting the infestation early, and then being sure of the extent of it. We need a program of continual vigilance, and investigation of any unusual losses of adult bees. If possible, some of the bees should be examined routinely for mites every time adult losses are investigated. Just the time and manpower to collect and examine adequate samples would be a problem in determining the extent of an infestation. Samples of 33 bees would give a 50-50 chance of missing a two percent infestation in a colony. Even 68-bee samples give the same odds on missing a one percent infection (6). Examination of a sample from only one colony would take as long as an hour.

Another small but important part of any control program is the educational and informational part. It would be necessary to give the beekeepers facts about the mite, and the controls necessary, so that they would fully understand their stake in the control program, and would co-operate wholeheartedly. In countries with long-established infestations, the opinion has been expressed that they have solved the problem of remedies, and now must educate and assist beekeepers so that they will make concerted efforts toward destroying the mites.

PLAN OF ERADICATION

If we are to consider a drastic plan to eradicate a future infestation of *Acarapis woodi* by quarantines and destruction of colonies, we must look first at our state apiary laws. They must be so written that they include the acarine mite (at least by definition) in any reference to diseases, especially in the enabling provisions for quarantines, hold orders, and destruction of bees. Provisions for emergency rules and regulations are also essential. The apiary laws in each state should be reviewed with these points in mind.

The possibility of discovering an infestation of the bee mite in California, or other states, is very real. Any unusual losses of adult bees should be investigated, and dying bees should be examined for evidence of mites in the tracheae. If you discover what appears to be *A. woodi*, get a positive identification immediately by a qualified acarologist, a specialist on mites. If the infestation is confirmed, notify your state department of agriculture and the United States Plant Quarantine Division. These agencies will

initiate state and federal assistance on the entire problem.

Action towards control of an incipient infestation of the acarine mite would, of necessity, begin with the establishment of an emergency quarantine area surrounding the infestation to prevent movement of bees into or out of the area. Inclusion of all the area within a three-mile radius of the infestation should allow a margin of safety until the history and extent of the infestation is known. Thorough investigation must be carried out concurrently with extensive surveys, so that the origin of the mites can be determined. If the infested bees have been moved in the past six months, surveys should be made for the presence of mites among bees at the previous locations.

The decisions on control measures to be used will depend on the time of year, number of bees in the area and extent of the infestation. Until chemical controls become more certain, it will probably be necessary to plan on destroying all live bees known to be infested as well as all those in a safety margin around them, perhaps in a radius of one to three miles. If so, a plan of remuneration for beekeepers might be considered necessary. The bees could be destroyed with cyanide, or they could even be anaesthetized with carbon dioxide in the hive in order to save the brood. The anaesthetized bees could be burned in a portable incinator.

With fairly effective control possible with acaricidal smoke, the area of total destruction could be kept to a minimum, with an additional surrounding area of treatment. A series of three treatments at weekly intervals should be given all colonies in the treatment area using Dimite, Chlorobenzilate, or Ovotran. The series should be repeated at least twice during the following spring and fall periods when average temperatures are 60-75° F. The bees should also be sampled at the time of each series of treatments. After three successive treatments, and six thorough surveys, with negative findings, the infestation should be eradicated.

We may never need a program of this kind. If we do, success will come much more readily if we recognize the symptoms produced by the mite, and if we have the knowledge and regulations to help in its control.

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Scotch Thistle (Onopordum Acanthium) In California

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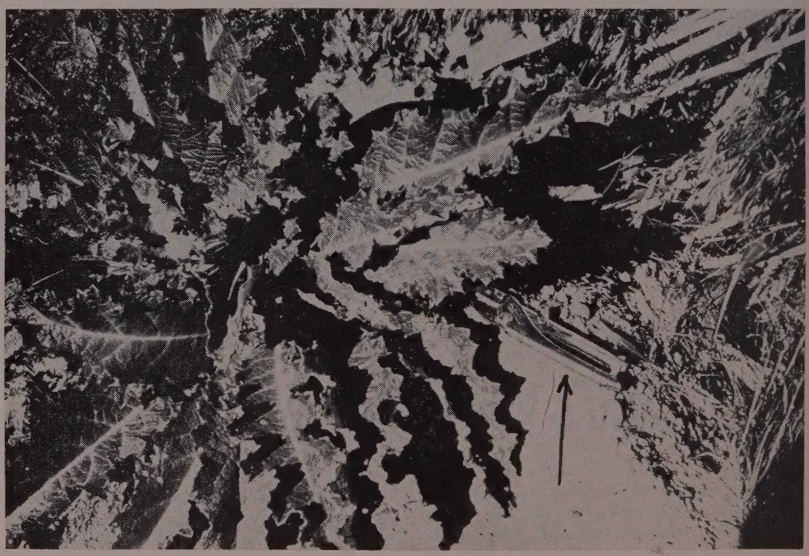
The Scotch Thistle, *Onopordum Acanthium* L., is a member of the Thistle Family, Compositae. The plants closely resemble the thistles of the genus Cirsium, except in Onopordum the receptacle inside the flower head is deeply pitted or honeycombed without the typical hairs found on the flat receptacles in Cirsium. The pappus or hairs on the achenes (seeds) in Onopordum are finely toothed or barbed, unbranched hairs, while those in Cirsium are finely branched or plumose.

The Scotch Thistle plant is a biennial, producing the first year a typical stemless rosette of leaves. The second year this rosette of leaves grows to form a coarse, repeatedly branching plant up to eight or nine feet tall and five or six feeet across. As with most thistles, this species, under poor growing conditions, will flower as a small depauperate plant scarcely a foot tall.

The leaves and stems of Scotch Thistle are covered with a dense mat of hairs. When the plant dries and loses its green color, this white tomentose covering of the plant is quite apparent and undoubtedly is the reason for calling this species the Cotton Thistle as well as Scotch Thistle. The leaves are somewhat lobed with stiff spines on the margins. These spiny margins of the leaves continue as prominent spiny wings down the stem. The purple flowers are borne in rather large heads up to 1½ inches across. The involucral bracts on the flower heads spread, each of them tapering to a stiff spine tip.

This species apparently grows best on the slope between the arid range land and the wet meadows or streams. Where there is a steep slope between these two habitats, the thistle plants occur in a more or less definite line. The major areas infested with this species consist of the low areas in the range land,



Stemless rosette of leaves produced in the first year of growth. Note arrow pointing to pruning shears which illustrates comparative size of the rosette.

above the meadow proper. These extensive depressions are sufficiently infested to exclude the cattle and cause a loss of feed production.

The first specimen was received for identification from Loring White, Agricultural Commissioner of Modoc County, in July, 1957. He had observed this species within the limits of Alturas for a number of years, but in 1957, occasional plants were found out from Alturas, indicating the possibility of spread. Consequently *Onopordum Acanthium* was placed in the Modoc County Weed Control Program.

In 1958, acting on information from Commissioner White, the writer investigated the major area of infestation of Scotch Thistle which is on the southern boundary of Modoc County near Adin and extending somewhat over the county line into Lassen County. It is estimated at the Hunt Estate Ranch that an area of 500 to 600 acres is infested and occasional plants appear over the whole area of this extensive ranch. The thistle was present on the ranch when purchased in 1942. In the spring of 1958, 100 acres of the thistle were sprayed with 2,4-D. The results were poor so the area was mowed later in the season. Spot infestations of this large plant are controlled by a man on horseback using a lariat. A large loop is dropped over the plant and tightened near the base and pulled. This method is very effective in preventing seed production of scattered plants, requiring no extra equipment.

Two-year-old Scotch Thistle plant. Note the comparative size of the plant to the man standing at the left. The plant grows eight to nine inches tall and is five to six feet across.

Scotch Thistle (*Onopordum Acanthum*) seed head.

A few plants of this thistle were observed July 9, 1958, at the Town of Bieber, Lassen County, between the road and the bank of the Pit River. The area had previously been sprayed with a weed killer.

On June 29, 1958, an infestation of Scotch Thistle was found in Lake County by Robert E. Barrett, Agricultural Inspector of Napa County, while he was on a Sunday fishing trip. The population in Lake County is confined to about five acres along Kelsey Creek in Cobb Valley about one-half mile north of Pine Grove. Personnel of the Lake County Department of Agriculture cut out the maturing plants and the rosettes are to be sprayed with 2,4-D. This infestation is near a sawmill that was moved to this location from Oregon about 1953.

Meadow Mouse Control in Holly

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A study was undertaken during 1957 to determine the most effective method of controlling meadow mice (*Microtus* sp.) that were girdling trees in a 140-acre commercial holly grove in Santa Cruz County. Control procedures in the past were limited to zinc phosphide and strychnine-treated baits, and quite often poor control was obtained because of bait refusal by the mice. White-footed mice (*Peromyscus* spp.) are present in the grove, but little if any damage is attributed to them.

The holly planting is located on rolling sand hills approximately one mile from the Pacific Ocean. The spread of these trees ranges from 8 to 12 feet in diameter at the base, and the tree tapers upward to a dense pyramidal crown. Cultural practices of

Holly plant damaged by meadow mice. The mice girdle the trunks and lower limbs of the plant.

growing holly require that a mulch be established around the base of a tree; this mulch rises as high as the lowest limb and may vary in depth from 4 to 12 inches. This mulch, with the densely foliaged lower limbs, creates an ideal habitat for the meadow mouse. A cover crop between the tree rows gives the mice added concealment and food.

The study was conducted to determine (1) the effectiveness of different types of bait material used to carry zinc phosphide, (2) the use of endrin and toxaphene as rodenticides, (3) the value of "Cefro," a polyvinyl acetate emulsion as a rodent repellent.

The insecticides, endrin and toxaphene have been used to control heavy mouse populations in the eastern and northern states, but due to the cost factor they are used mainly as a tool to supplement poison bait applications if the general mouse population increases rapidly. Poison baits properly applied are adequate to reduce meadow mouse populations under most conditions, but in orchards under heavy mouse pressure the elimination of all mice is necessary to stop tree damage.

Meadow mouse (*Microtus* sp.). U. S. Fish and Wildlife photo.

Damage

Meadow mice have killed or caused severe damage to many holly trees by girdling the trunks and lower limbs. The extent and severity of damage may vary from year to year when a normal mouse population is present, but in years of high population damage is heavy throughout the grove. The loss due to mice over a period of years is estimated to be 100 to 150 trees. Other trees have been damaged to such an extent that they will not be productive for several years.

Control

Steam-crushed whole oats (obtained from the U. S. Fish and Wildlife Service, Pocatello, Idaho) oat groats, rolled wheat, canary grass seed, apple pumice, cubed apples and chick scratch were treated with zinc phosphide at a rate of 1 pound to 100 pounds of bait and placed in the mouse runways or adjacent to the burrows. The acceptance of the steam-crushed whole oats far exceeeded that of the other baits.

To protect the bait from inclement weather, semipermanent bait stations were devised. Two-inch openings were cut in the ends of quart and pint milk cartons, and the baited cartons were placed in the mouse runways. These stations proved very successful. Mice entered the first night and consumed all the bait.

During June of 1957, a one-quarter acre plot consisting of 24 holly trees was treated with endrin at a rate of two pounds per acre by the use of a speed sprayer. The jets were set so that the spray pattern entered the skirt of the tree for approximately 18 inches and extended out into the cover crop for about 12 inches. A strip between the rows about six feet wide was also treated. All orifice jets on the sprayer were closed except the bottom four on each side. As a buffer area the rows of trees adjacent to the endrin plots were baited with zinc phosphide treated steam crushed oats placed in milk cartons. Twenty days after treatment, a trap line was run on the endrin plots, but no mice were caught, while on an adjacent untreated area a similar trap line caught several *Microtus*. A periodic survey of the treated area supplemented by trapping revealed no mice until mid-August. At this time visual sign of mice was pronounced, and the trap line confirmed the survey. The endrin treatment kept the area free of mice for approximately 58 days.

During October of 1957, trials were conducted on one-quarter acre plots using en-

drin at a rate of two pounds per acre and toxaphene at four, six and eight pounds per acre. The material was applied by a power sprayer using a Boom Jet spray nozzle. This nozzle gave excellent spray penetration of the foliage and the ground cover. All materials were applied at 300-350 gallons of spray per acre, or enough material to wet the foliage and ground cover.

Periodic surveys supplemented by trapping at two-week intervals revealed that the endrin treated area was kept free from mouse activity for approximately 71 days.

The four- and six-pound-per-acre toxaphene plots resulted in a small reduction of the mouse population. The eight-pound toxaphene treatment gave an estimated 80 percent control. A buffer area baited with steam-crushed whole oats treated with 1080 at a rate of 3 ounces to *100 pounds* of bait gave a high degree of control, but its use necessitates the supervision of an official agency.

Repellent

A 5 percent Cefro polyvinyl acetate emulsion was sprayed around and under the holly trees to wet the mulch and basal limbs of the trees. The material was applied at a rate of one gallon to 300 square feet. The repellent halted mouse damage to the trees for approximately 31 days; no toxicity to the trees was noted.

Conclusions of the Study

1. The application of endrin made during the cooler season of the year appeared more favorable and longer lasting than the application made in July. Apparently the residual action of endrin is greater in cooler weather.

2. Complete coverage of the cover crop and lower foliage of the tree is necessary. Although endrin may kill mice by contact, the main killing action is by eating the foliage.

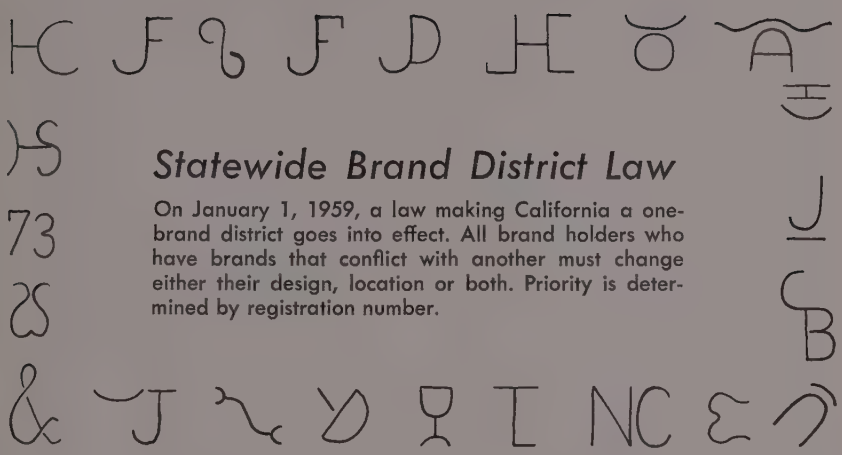
3. The use of endrin for mouse control is advised when a heavy buildup in the mouse population occurs and presents an immediate hazard to the trees.

4. The cost of endrin at the two-pound-per-acre rate is $20.93 per acre for the material. The cost of toxaphene at eight pounds per acre is $6.90.

5. Trapping records indicate that the mouse population is at a low ebb during the summer months therefore control with poison baits can be undertaken at this time to reduce the population further, and to prevent a damaging buildup during the fall.

6. Zinc phosphide-treated baits will control *Microtus*, but do not give good control of *Peromyscus*. 1080-treated baits give good control of both *Microtus* and *Peromyscus*.

7. The rodent repellent features of "Cefro" are too short lived to be economically feasible for mouse control under the prevailing conditions.



Statewide Brand District Law

On January 1, 1959, a law making California a one-brand district goes into effect. All brand holders who have brands that conflict with another must change either their design, location or both. Priority is determined by registration number.

PAUL ROBERTSON, Assistant Chief, Bureau of Livestock Identification

Cattle branding in California is older than the United States itself. Historical records reveal that as early as 1769, seven years before the Declaration of Independence, a cattle brand was used by the padres of the San Diego Mission. As the west grew and became modernized, the problems of livestock identification increased.

After California became a state, and county lines were established, the official recording of cattle brands fell into an organized pattern. Prior to 1918 cattle brands were recorded in the county records with little or no attention paid to what brands neighboring counties had recorded.

First Law Created Cattle Protection Board

The first step towards organizing and controlling the growing problem of duplicate and conflicting brands came on May 28, 1917. On that date an act to prevent cattle thieving was passed by the State Legislature. It created the State of California Cattle Protection Board, and was entered as Chapter 678 of the laws of 1917.

The act created 58 brand districts for purposes of brand registration. Requirements were simple; a person having a brand registered in one county had an exclusive right to that brand in the county where registered, and in all counties adjacent thereto.

As California grew, motor and rail transportation created new problems which rendered the old cattle protection law unworkable. Trucking or rail shipment for long distances increased the chances of confusing brands. Where Southern California cattle were moved to Northern California for pasture, the chance was great that they carried brands identical to those on cattle already in the north. For example, in 1919, there were 15 lawfully registered identical "A" brands in California. With such a situation, it was increasingly apparent that cattle with identical brands and different owners were being mixed, creating a problem of ascertaining true ownership.

The Law Today Creates One-brand District

In 1947 the California Legislature passed a law which, in effect, does away with the many brand districts, and which makes the State a "one-brand" district. The 1947 law is now Section 337 of Article 3, Division 3 of the California Agricultural Code. It reads: "*It is the ultimate object of this chapter to provide for statewide recordation of brands with the entire State as one branding district. To conform to this objective, all applications for the recordation of a brand on and after the effective date of this chapter shall be accepted by the chief only when not in conflict with any other recorded brand in this State. On and after January 1, 1959, the right to use any brand which conflicts with any brand having a prior cattle brand registration certificate number under provisions of this chapter shall be forfeited, and all recordations thereafter shall be on a statewide basis.*"

FIRST CATTLE BRANDS RECORDED BY CALIFORNIA COUNTY RECORDERS

Name of county	By whom recorded	Date of registration	City
Santa Barbara	Patricio Cota & Jose A. Arellanes	October 24, 1834	Santa Barbara
Los Angeles	Prospero	February 26, 1835	Los Angeles
Marin	Gregorio Briones	September 4, 1834	San Rafael
San Diego	H. D. Fitch	February 22, 1847	San Diego
Siskiyou	Samuel B. Jackson	October 9, 1852	Yreka
Sierra	Anna McMahon	January 9, 1869	Downieville
Shasta	Thos. Asbury & Bros.	January 16, 1860	Redding
Santa Cruz	Miguel Villa Grau	August, 1850	Santa Cruz
San Luis Obispo	Capt. John Wilson	May 27, 1851	San Luis Obispo
Santa Clara	Francisco Bevwal	June 28, 1852	San Jose
San Mateo	Belmaro O. Harko	November 6, 1856	Redwood City
San Joaquin	Heath & Emory	April 29, 1857	Stockton
San Bernardino	Dolores Merilla de Valdez	May 8, 1861	San Bernardino
San Benito	Lewis Gibbon	April 10, 1874	Hollister
Sacramento	John F. Rhodes	May 28, 1850	Sacramento
Riverside	Wm. Vawler	August 15, 1893	Riverside
Plumas	R. A. Fairchilds	June 22, 1854	Quincy
Orange	S. J. & Oscar Rosenbaum	April 15, 1890	Santa Ana
Placer	Cox Co.	January 27, 1851	Auburn
Nevada	Joseph Peters	April 29, 1873	Nevada City
Napa	John Custer & William M. Reed	January 7, 1851	Napa
Monterey	George Kempt	May 18, 1850	Monterey
Modoc	John Caldwell	June 8, 1874	Alturas
Merced	Barfield & Ruddle	May 25, 1855	Merced
Mendocino	White & Simpson	May 27, 1859	Ukiah
Mariposa	P. B. Nagle	July 17, 1852	Mariposa
Madera	Agnes Keith	June 20, 1893	Madera
Lassen	Thomas Watson	October 20, 1864	Susanville
Lake	Hiram Kennedy	March 30, 1870	Lakeport
Kings	A. G. Sousa	June 2, 1893	Hanford
Kern	John R. Beck	July 23, 1866	Bakersfield
Inyo	Robert W. Ford	January 9, 1870	Independence
Imperial	W. L. Bright	October 15, 1907	El Centro
Alameda	Calvin James	July 5, 1853	Oakland
Alpine	Love & Tanner	April 20, 1874	Markleeville
Amador	Allen & Rieck	April 27, 1863	Jackson
Butte	Isaiah I. Armstrong	December 25, 1850	Oroville
Calaveras	Garcilon & Kallanbach	July 20, 1855	San Andreas
Colusa	Daniel Griswould	October 6, 1857	Colusa
Contra Costa	Augustine Alviso	May 26, 1856	Martinez
Del Norte	Henry Haley	July 27, 1877	Crescent City
El Dorado	A. B. Lutz	March 25, 1851	Placerville
Fresno	James E. Haddon	December 9, 1856	Fresno
Glenn	Warren Green & Eugene Butter	October 29, 1901	Willows
Humboldt	Martin & Nichols	October 13, 1853	Eureka
Solano	Thomas J. Bedford	October 30, 1854	Fairfield
Sonoma	Israel Brockman	May 26, 1847	Santa Rosa
Stanislaus	G. F. Smith	September 27, 1854	Modesto
Sutter	Samuel Brannan	March 2, 1860	Yuba City
Tehama	P. W. Hayes	July 14, 1856	Red Bluff
Trinity	James Hoadley	April 4, 1862	Weaverville
Tulare	John Fancher	December 17, 1852	Visalia
Tuolumne	Emanuel Linoberg	September 7, 1850	Sonora
Ventura	John Hosler	May 24, 1873	Ventura
Yolo	Chas. Lewis Cady	July 1, 1850	Woodland
Yuba	Charley Phelps	October 3, 1850	Marysville

CATTLE BRANDS OF CALIFORNIA MISSIONS

NAME	FOUNDED	LOCATION	BRAND	CATTLE
SAN DIEGO DE ALCALA	1769	SAN DIEGO	D	8 000
SAN LUIS REY DE FRANCIA	1798	SAN LUIS REY	J	26 000
SAN JUAN CAPISTRANO	1776	CAPISTRANO	CA	10 000
SAN GABRIEL ARCANGEL	1771	LOS ANGELES	T	20 500
SAN FERNANDO REY DE ESPAÑA	1797	SAN FERNANDO	4	12 500
SAN BUENA VENTURA	1782	VENTURA	AB	17 300
SANTA BARBARA	1786	SANTA BARBARA	⊕	3 600
SANTA INEZ	1804	SANTA INEZ	LO	7 300
LA PURISMA CONCEPTION	1787	CONCEPTION	9	10 500
SAN LUIS OBISPO DE TOLOSA	1772	SAN LUIS OBISPO	S	8 600
SAN MIGUEL	1797	SAN MIGUEL	3	9 000
SAN ANTONIO DE PADUA	1771	MONTEREY CO.	A	5 000
NUESTRA SENORA DE LA SOLEDAD	1791	SOLEDAD	S	6 600
SAN CARLOS BORROMEO DEL CARMELO	1771	CARMEL	MR	2 050
SAN JUAN BAUTISTA	1797	SAN JUAN	A	11 000
SANTA CRUZ	1791	SANTA CRUZ	A	3 500
SANTA CLARA	1777	SANTA CLARA	SA	9 000
SAN JOSE	1797	MISSION SAN JOSE	J	2 000
SAN FRANCISCO DOLORES	1776	SAN FRANCISCO	F	4 200
SAN RAFAEL ARCHANGEL	1817	SAN RAFAEL	G	1 200
SAN FRANCISCO DE SOLANO	1824	SONOMA	F	2 500

Recording of cattle brands in California began when the Spanish missions adopted identifications for their extensive cattle herds.

STATE OF CALIFORNIA
DEPARTMENT OF AGRICULTURE
BUREAU OF LIVESTOCK IDENTIFICATION
CATTLE PROTECTION
SACRAMENTO 14, CALIFORNIA

APPLICATION FOR CATTLE BRAND

FOR STATE-WIDE USE

....19
Date of Application

INSTRUCTIONS: Complete application in full.

a. Each of the first three spaces on the form should be filled in with a different design for a brand, and all branding positions listed in the fourth space that are acceptable for any one of the designs that can be recorded.

b. The application MUST BE SIGNED IN INK by the applicant in space provided. If more than one person is to have an interest in the brand, and each cannot sign the form, the full names may be given by one applicant.

c. The brand must be made and used exactly as recorded. Using it in any other manner is illegal and is subject to penalty.

PRINT NAME OR NAMES OF APPLICANTS.....
(If individual or partnership, list name or names. If corporation, list names of officers)

DATE OF BIRTH . . .

ADDRESS .....
(Street or Post Office Address) (City or Town) (State)

Applicant Must Sign Here ➔ .....

If applicant is under 21 years of age application must be countersigned by parent or guardian

Printed or Typewritten Signature Not Accepted

(Countersignature)

BRAND DRAWINGS. Submit Three Choices.

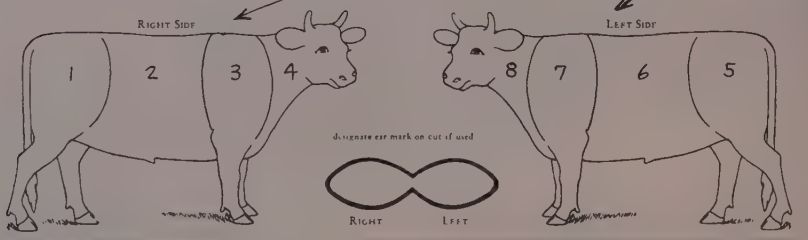
Exact drawing of brand—Do not type

FIRST CHOICE	SECOND CHOICE	THIRD CHOICE
NAME OF BRAND	NAME OF BRAND	NAME OF BRAND

Location of brand

Show preference of place on animal where brand is to be applied by numbers, 1st, 2nd, 3rd, etc.

RIGHT		LEFT	
Hip	1	Hip	5
Ribs	2	Ribs	6
Shldr	3	Shldr	7
Neck	4	Neck	8



RECORDING FEE $2.00. Make your remittance payable to STATE DEPARTMENT OF AGRICULTURE and mail this application to:

Cashier
State Department of Agriculture
Sacramento 14, California

Recorded in office of the Bureau of Livestock Identification, Sacramento

Livestock Identification Brands RC

Application for cattle brand includes a drawing of the animal. This application has been marked and numbered to illustrate the eight available locations for branding cattle.

Brand Positions Established

Prior to January 14, 1954, there were no branding positions established by law. At that time eight legal positions were designated by regulation. They are the neck, shoulder, rib, and hip on each side of the animal.

In the early days of brand registration, some brands were recorded to be used in combination. That is, one design on one location and another design on a different location were used together as a "combination" brand. The 1953 Legislature passed a law which prohibits the recording of a "combination" brand. The law did away with the inequity of allowing two branding positions for a single renewal fee. An individual may still legally record two brands, but only by two separate recordations.

Other early day branding positions included the "britchen" brand which consisted of marking the rump. Another position was the rafter or bar brand placed across the "backbone" of the animal. The 1953 law also did away with these positions. Today "britchen," "backbone" and "combination" brands are illegal.

Determining Seniority of Brands

The 1947 law allowed cattle brand holders 12 years to adjust conflicting brands. That 12-year period ends on January 1, 1959.

Since the enactment of the statewide brand provision, many cattlemen have been reluctant to change their brand design or location, hoping that the person holding the brand with priority would adjust or fail to renew his brand. Consequently, at this time, only a few months before the deadline, there are hundreds of brands which are still in conflict, and which will be cancelled automatically on January 1, 1959.

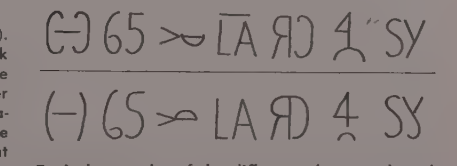
The adjustment of conflicting brands is based on a priority or seniority basis. Each brand registered in California with the Bureau of Livestock Identification has a registration number. The registration numbers run consecutively from one forward and includes the most recently registered brand. Thus, where brands are identical in design and are registered to be used in identical positions, all must be changed except one. The one to remain unchanged has the lowest registration number.

Faulty Iron Construction

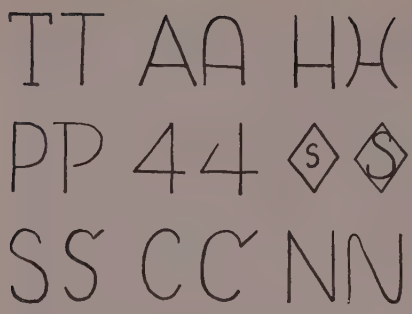
Another problem, somewhat related to the conflict of brands, is the fact that many irons now used by cattlemen do not conform to the design recorded with the bureau for their use. This nonconformity may be due to several reasons. The brand certificate showing the recorded design may have been lost, so that the owner himself is not aware of the exact design recorded for his use. In other cases, the blacksmith or person who made the iron may have failed to follow the exact design, or possibly the iron may have become damaged or worn through years of use. The situation thus created is that some cattlemen may be branding their cattle with a brand actually recorded to another. The "one brand district" law which becomes effective on January 1, 1959, will not remedy this situation. This can be done only by a careful check of the irons used against the design recorded. The result of the comparison will be that some irons will have to be remade.

Of interest to persons who are using irons that do not conform to the registered design, is the fact that presumption of ownership is usually with the recorded owner of the registered brand. Therefore it is the responsibility of each brand holder to see

Oldest current brand in California today (left). Registration number 2, registered to the R. E. Jack Company, San Luis Obispo County. One of the most recent brand registrations (right), number 84,578, registered to Raymond Muller, San Joaquin County. Both brands are registered for use on the left hip and are considered to be excellent designs. The brand on the right illustrates the fact that there are still many good designs eligible for recordation.



Typical examples of the difference between branding irons as made and used (bottom), and the design as officially recorded (top).



Examples of brand designs and variations which are considered not to be conflicting.

that his iron is identical to the drawing or design on his certificate of record. Certificates lost or misplaced can be duplicated for $1 by proper application to the Bureau of Livestock Identification, California Department of Agriculture, 1220 N Street, Sacramento 14, California.

It is the policy of the department to rule as many existing brands as possible to be statewide. Wherever there is a discernable distinction of any kind, both brands will be allowed to be registered on a statewide basis.

Procedure for Notification of Conflicting Brands

Brand holders whose brands will be canceled under provisions of Section 337 of the Agricultural Code will not receive a renewal notice for 1959, or for any year following. Any brand holder who receives his renewal notice may, therefore, assume that his brand has been ruled to have statewide status, and that it will not be canceled except for failure to pay renewal fees when due. A cattleman who does not receive a renewal notice may assume that his brand has been canceled. To use an unrecorded, forfeited or canceled brand is a misdemeanor, and penalties for conviction are provided in the Agricultural Code for such violation.

The Bureau of Livestock Identification will notify all brand holders whose brands do not have a statewide status. If a brand does not have statewide status it will be canceled. The only alternative is to make application for a new design, or possibly a new location for the existing design.

Insects and Mites Associated With Stored Foods and Seeds in California

R. G. STRONG [1] and G. T. OKUMURA [2, 3]

Insects attacking whole cereal grains were given major consideration in previous surveys for storage pests in California (Doane 1918; Linsley and Michelbacher 1943; Mackie and Carter 1937), and concern over insect infestations was directed toward the primary pests of grain. More recently attention has been given to all pests associated with foods and seeds in storage. Today, losses from storage pests cannot be measured only by the amounts of food or seed destroyed by insects. The mere presence of insects or insect fragments in foods has become objectionable to the American consumer. Thus, economic losses may result from insect contamination although actual losses of food materials due to insect feeding may be negligible.

An extensive survey of insects associated with foods and seeds in storage was begun in October, 1953, when specimens collected in Tulare County, California, were identified (Allen and Linsley 1954) as the khapra beetle, *Trogoderma granarium* Everts. Establishment by the Bureau of Plant Quarantine, California Department of Agriculture, of the California Khapra Beetle Interior Quarantine in January of 1955 with plans for the eradication of this new storage pest in the United States intensified inspections for this insect.

Collections of insects and mites associated with stored foods and seeds are made continuously by county, state, and federal inspectors in their search for every khapra beetle infestation in California. Specimens are identified and recorded by Systematic Entomologists in the Bureau of Entomology of the California Department of Agriculture.

It is the purpose of this report to summarize results of the survey (Khapra Beetle Survey) made for storage pests in California from October, 1953, to June, 1958. A list of insects and mites has been prepared from records made during the survey to supply information regarding the distribution, food habits, and relative abundance of species associated with stored foods and seeds in California.

Arrangement of List of Insects and Mites

The list of Arthropods found in association with stored foods and seeds is presented in an alphabetical arrangement for the convenience of the reader. It has the following general form:

Class
  Order
    Family
      Genus
        Species
          Counties
          Hosts

The list of counties from which collections have been made indicates the distribution of species in California. Food habits are indicated by the list of hosts for each species. It should be noted, however, that the hosts listed are not necessarily true hosts for the species. Thus, the true meaning of the term "hosts" in this report is "hosts, or associated with."

Whenever possible the exact kinds of foods or seeds are given; otherwise a more general term is used. All processed animal foods are listed simply as mixed feeds. On occasion the habitat is listed rather than hosts, for example—beehives, since the exact hosts were unknown in these instances.

The relative abundance and importance of species is indicated by distribution and host range in California. Information on population densities, however, cannot be obtained from the survey.

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[3] The authors gratefully acknowledge the assistance of Mr. Francis Louis Blanc, Supervisor of Field Surveys, Bureau of Entomology, California Department of Agriculture, Sacramento, California, in summarizing records and preparation of the report.

Parasites and predators of storage pests collected during the survey are given in a simple alphabetical arrangement at the end of the list of pests associated with stored foods and seeds.

LIST OF INSECTS AND MITES FOUND IN ASSOCIATION WITH STORED FOODS AND SEEDS IN CALIFORNIA

Arachnida

Acarina

Acaridae

Acarus siro L.
COUNTIES: Fresno, Santa Barbara, Sonoma
HOST: Mixed feeds

Tyrophagus dimidiatus Herm.
COUNTY: Riverside
HOST: Mixed feeds

Glycyphagidae

Glycyphagus domesticus (DeG.)
COUNTIES: Fresno, Humboldt, Kings, Lake
HOSTS: Dried fruits, oats and other grains, walnuts

Insecta (Hexapoda)

Coleoptera

Anthicidae

Anthicus spp.
COUNTIES: Fresno, Kern, Kings, Los Angeles, San Joaquin, Santa Cruz
HOSTS: Barley and other grains, cottonseed meal

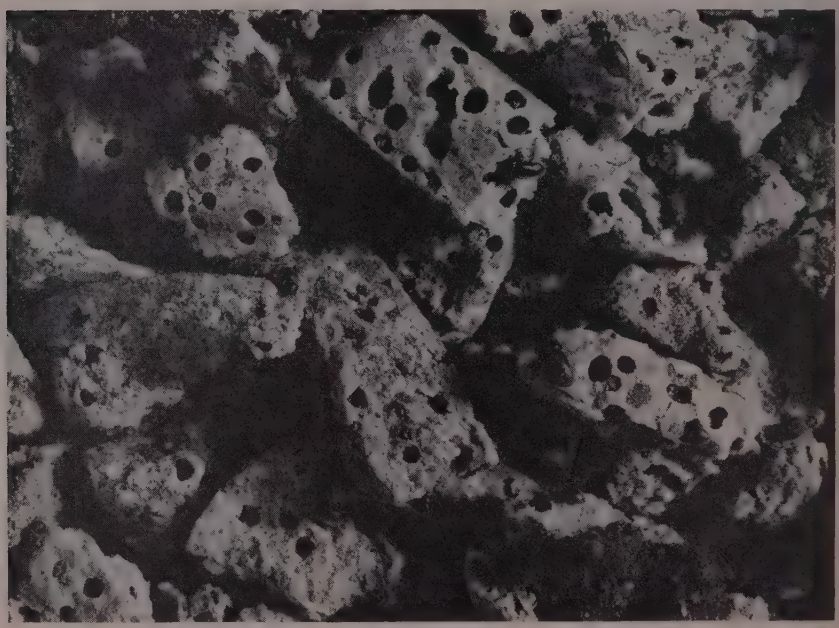
Formicilla munda munda LeConte
COUNTY: Imperial
HOST: Grain

Notoxus calcaratus Horn
COUNTIES: Kern, Kings
HOSTS: Barley, mixed feeds

Anobiidae

Catorama sp.
COUNTIES: Fresno, Kings, Merced, Riverside, San Joaquin, Tulare
HOSTS: Beet seed, mixed feeds, safflower seed

Lasioderma serricorne (F.) Cigarette beetle



Dog food riddled by drug store beetles. Kenneth L. Middleham photo.

Beans severely injured by bean weevils. Note the eggs deposited on the surface of beans and the large exit holes made by adult weevils. Kenneth L. Middleham photo.

Counties: Alameda, Contra Costa, Fresno, Imperial, Kern, Kings, Los Angeles, Merced, Orange, Riverside, San Bernardino, San Diego, San Francisco, San Joaquin, Santa Barbara, Santa Cruz, Stanislaus, Tulare, Ventura

Hosts: Alfalfa seed, almond hulls, barley, beans, cigarettes, copra, copra meal, copra meal cake, corn meal, cottonseed meal, fish meal, flour, hay, lettuce seed, milo, mixed feeds, safflower meal, safflower meal cake, soybean meal, sunflower seed, tobacco, wheat, wheat bran

Stegobium paniceum (L.) Drug-store beetle

Counties: Alameda, Butte, Del Norte, Fresno, Glenn, Humboldt, Kern, Kings, Los Angeles, Mendocino, Merced, Monterey, Orange, Placer, Riverside, San Benito, San Bernardino, San Diego, San Francisco, San Joaquin, San Luis Obispo, San Mateo, Santa Barbara, Santa Clara, Santa Cruz, Solano, Stanislaus, Sutter, Tehama, Tulare, Ventura, Yolo

Hosts: Alfalfa meal, barley, beans, beet seed, copra meal, corn meal, cottonseed meal, cottonseed meal pellets, cucumber seed, fish meal, flour, garbanzos, milo, mixed feeds, mustard seed, nut meats, spaghetti, wheat, wheat bran, wheat germ

Bostrichidae

Rhyzopertha dominica (F.) Lesser grain borer

Counties: Alameda, Butte, Colusa, Contra Costa, Fresno, Imperial, Kern, Kings, Lake, Madera, Merced, Monterey, Orange, Placer, Riverside, Sacramento, San Benito, San Bernardino, San Diego, San Luis Obispo, San Mateo, Santa Barbara, Santa Clara, Santa Cruz, Stanislaus, Sutter, Tulare, Yolo, Yuba

Hosts: Barley, beans, corn, milo, mixed feeds, oats, rice, rye, soda crackers, sorghum, wheat

Bruchidae

Acanthoscelides obtectus (Say) Bean weevil

COUNTIES: Imperial, Riverside, Sacramento, San Mateo, Santa Cruz, Solano, Yolo
HOSTS: Beans, milo

Algarobius prosopis (LeConte)
COUNTIES: Imperial, Riverside
HOSTS: Beans (in pod), mixed feeds, rolled barley

Bruchus griseolus (Fall)
COUNTY: Imperial
HOST: Sesbania seed

Bruchus prisorum (L.) Pea weevil
COUNTIES: Butte, Glenn, Kern, Modoc, Santa Cruz, Siskiyou, Tehama, Yolo
HOSTS: Austrian peas, garden peas, horse beans, grain

Bruchus rufimanus Boh. Broadbean weevil
COUNTIES: Kern, San Mateo, Santa Cruz, Stanislaus, Yolo

HOSTS: Grain, horse beans, medicinal herbs

Callosobruchus maculatus (F.) Cowpea weevil
COUNTIES: Glenn, Humboldt, Kern, Kings, Madera, Riverside, San Bernardino, San Joaquin, Siskiyou, Solano, Stanislaus, Tulare
HOSTS: Beans, sorghum

Neltumius arizonensis (Schaeffer)
COUNTY: Riverside
HOST: Beans (in pod)

Cleridae

Necrobia rufipes (DeG.) Red-legged ham beetle
COUNTIES: Alameda, Contra Costa, Imperial, Los Angeles, San Diego, San Francisco, San Joaquin, Santa Barbara, Santa Clara, Solano, Sonoma
HOSTS: Copra, copra cake, copra meal, cured meat, dehydrated chicken soup, hemp, rice and other grains

Colydiidae

Aglenus brunneus (Gyll.)
COUNTIES: Fresno, Merced, Orange, Santa Barbara
HOSTS: Grain, mixed feeds

Cryptophagidae

Cryptophagus spp.
COUNTIES: Butte, Colusa, Contra Costa, Del Norte, Fresno, Glenn, Humboldt, Kern, Kings, Los Angeles, Madera, Merced, Monterey, Orange, Riverside, Sacramento, San Diego, San Joaquin, San Luis Obispo, Santa Barbara, Santa Clara, Santa Cruz, Solano, Sonoma, Stanislaus, Tulare, Ventura
HOSTS: Alfalfa hay, barley, beet seed, cotton seed, dahlia tubers, flour, milo, mixed feeds, rice, walnuts, wheat

Henoticus californicus (Mann.)
COUNTIES: San Diego, Santa Cruz
HOSTS: Apple pulp, orange pulp

Cucujidae

Laemophloeus ferrugineus (Steph.) Rusty grain beetle
COUNTIES: Imperial, Kern, Riverside, Solano
HOSTS: Barley and other grains

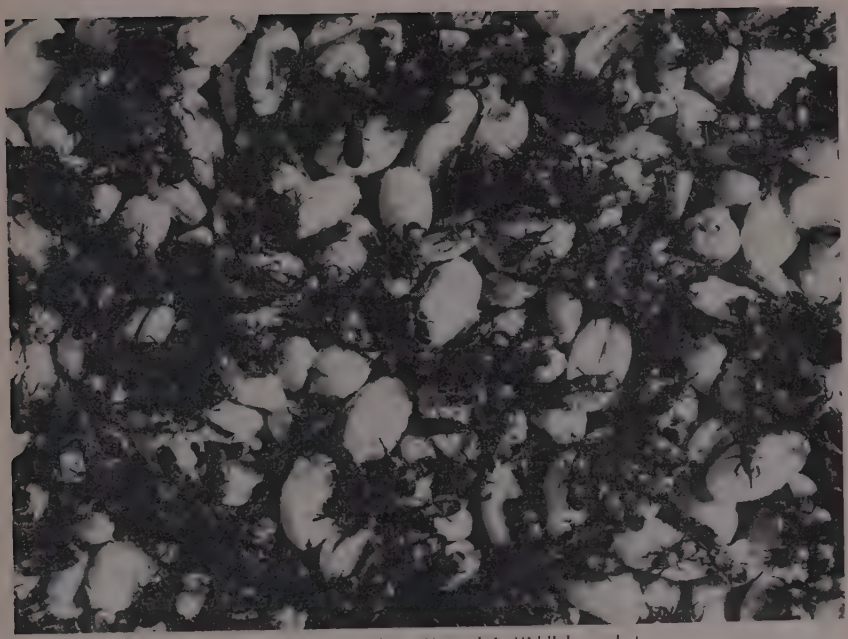
Laemophloeus pusillus (Schönh.) Flat grain beetle
COUNTIES: Butte, Contra Costa, Humboldt, Imperial, Kings, Orange, Riverside, San Joaquin, Santa Clara, Stanislaus, Tulare, Yuba
HOSTS: Barley, corn, milo, mixed feeds, safflower seed, wheat

Curculionidae

Caulophilus latinasus (Say) Broad-nosed grain weevil
COUNTIES: Imperial, San Diego
HOSTS: Animal matter (dried), barley

Sitophilus granarius (L.) Granary weevil
COUNTIES: Alameda, Butte, Colusa, Contra Costa, Fresno, Humboldt, Imperial, Kern, Kings, Lake, Lassen, Madera, Merced, Monterey, Napa, Placer, Riverside, Sacramento, San Benito, San Bernardino, San Diego, San Francisco, San Joaquin, San Luis Obispo, Santa Barbara, Santa Clara, Santa Cruz, Solano, Sonoma, Stanislaus, Sutter, Tehama, Tulare, Ventura, Yolo, Yuba
HOSTS: Barley, beans, milo, mixed feeds, oats, rice, rye, spinach seed, wheat, wheat bran

Sitophilus oryza (L.) Rice weevil
COUNTIES: Alameda, Fresno, Imperial, Kern, Kings, Modoc, Monterey, Placer, Riverside, San Bernardino, San Diego, San Mateo, Santa Barbara, Santa Cruz, Shasta, Solano, Stanislaus, Tulare, Yolo, Yuba
HOSTS: Alfalfa seed, barley, cotton seed, Dallis grass seed, liver meal, milo, mixed feeds, rice, rice hulls, vetch seed, wheat



Granary weevils on wheat. Kenneth L. Middleham photo.

Wheat protected from insects. No evident injury from insect infestation. Kenneth L. Middleham photo.

Dermestidae

Anthrenus flavipes Lec. Furniture carpet beetle

COUNTY: Butte

HOSTS: Barley, mixed feeds

Anthrenus pimpinellae F.

COUNTIES: Butte, Glenn

HOST: Mixed feeds

Anthrenus scrophulariae (L.) Carpet beetle

COUNTIES: Butte, Fresno, Kings, Merced

HOSTS: Mixed feeds, rolled barley, water grass seed

Anthrenus verbasci (L.) Varied carpet beetle

COUNTIES: Alameda, Amador, Butte, Calaveras, Colusa, Contra Costa, El Dorado, Fresno, Glenn, Kern, Kings, Lake, Madera, Marin, Mendocino, Merced, Modoc, Napa, Placer, Plumas, Riverside, Sacramento, San Benito, San Bernardino, San Diego, San Francisco, San Joaquin, San Luis Obispo, San Mateo, Santa Barbara, Santa Clara, Santa Cruz, Sierra, Solano, Sonoma, Stanislaus, Sutter, Tehama, Tulare, Ventura, Yolo, Yuba

HOSTS: Almond hull meal, barley, beans, beehives, blood meal, clover seed, copra meal, corn, corn meal, cotton seed, cowhides, fish meal, insect collections, garbanzos, melon seed, milo, milled rice, mixed feeds, mud dauber nests, powdered dried eggs, rice, rolled barley, rye, soybean meal, spider egg masses, Sudan grass seed, wasp nests, wheat, wool cloth

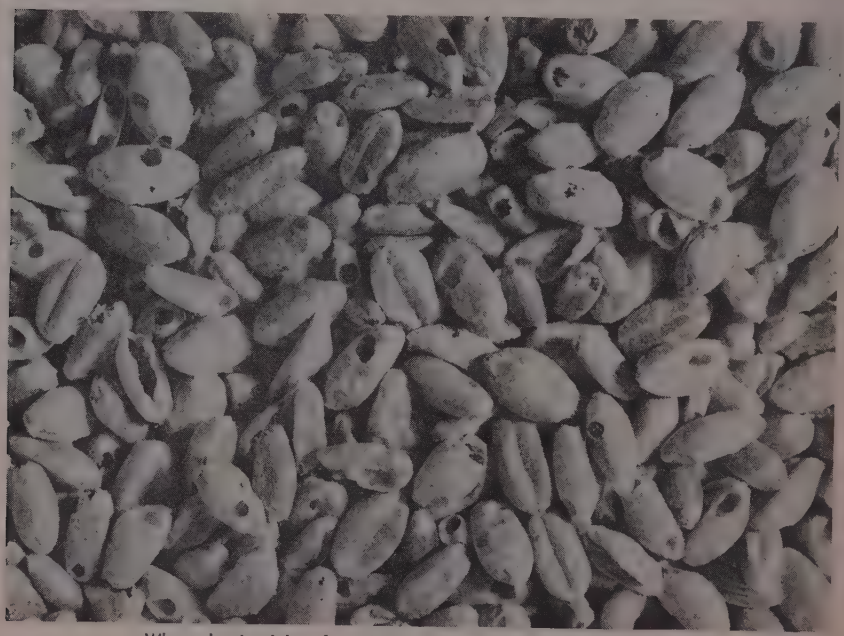
Attagenus alfierii Pic

COUNTIES: Imperial, Riverside, San Diego

HOSTS: Barley, cottonseed meal cake, mixed feeds

Attagenus piceus (Oliv.) Black carpet beetle

COUNTIES: Alameda, Amador, Butte, Calaveras, Colusa, Contra Costa, Fresno, Glenn, Imperial, Inyo, Kern, Kings, Lake, Lassen, Los Angeles, Madera, Mendocino, Merced, Modoc, Monterey, Napa, Orange, Placer, Plumas, Riverside, Sacramento, San Bernardino, San Diego, San Joaquin, San Luis Obispo, Santa Barbara, Santa Clara, Santa Cruz, Shasta, Sierra, Solano, Sonoma, Stanislaus, Sutter, Tehama, Tulare, Tuolumne, Ventura, Yolo, Yuba



Wheat showing injury from rice weevils. Kenneth L. Middleham photo.

Hosts: Alfalfa meal, alfalfa seed, almond hull meal, barley, beans, breakfast cereals, copra meal, corn, corn cobs, cotton seed, cottonseed meal, cottonseed meal cake, dead rats (dried), dried meat scraps, fish meal, grass seed, hides, linseed oil meal, milo, mixed feeds, oats, powdered dry milk, rice, rolled barley, safflower seed, soybeans, spinach seed, sunflower seed, vetch seed, walnut meats, wheat, wheat bran, wool rugs

Cryptorhophalum apicale Mann.

County: Yuba
Host: Grain

Dermestes ater DeG. Black larder beetle

Counties: Alameda, Fresno, Imperial, San Bernardino, San Joaquin
Hosts: Dehydrated chicken soup, meat scraps, mixed feeds

Dermestes frischii Kug.

Counties: Butte, Imperial, Santa Cruz
Hosts: Mixed feeds, wheat

Dermestes maculatus DeG. Hide beetle

Counties: Alameda, Contra Costa, Fresno, Merced, Riverside, San Diego, Santa Clara, Santa Cruz, Sonoma, Stanislaus
Hosts: Bird seed, bone meal, fish meal, meat scraps, mixed feeds, wasp nests

Dermestes marmoratus Say. Common carrion beetle

County: Merced
Host: Mixed feeds

Dermestes spp.

Counties: Alameda, Butte, Contra Costa, Fresno, Imperial, Kern, Kings, Modoc, Nevada, Placer, Riverside, San Bernardino, San Diego, San Joaquin, San Mateo, Santa Cruz, Sierra, Yolo
Hosts: Alfalfa seed, Austrian peas, beehives, cotton seed, dried meat scraps, fish meal, mixed feeds, pecan meats, rabbit hides, rice and other grains, sheep skins, wasp nests

Novelsis andersoni Beal

Counties: Imperial, San Bernardino
Hosts: Mixed feeds, oats, seeds

Novelsis horni (Jayne)

Counties: Imperial, Kern, Kings
Hosts: Grain, Sudan grass seed

Novelsis uteana Casey

County: Imperial
Host: Mixed feeds

A heavy infestation of rice weevils in wheat. Kenneth L. Middleham photo.

Novelsis varicolor (Jayne)

County: Imperial
Hosts: Barley, mixed feeds, pigeon droppings

Novelsis spp.

Counties: Amador, Butte, Colusa, Glenn, Imperial, Kern, Kings, Lake, Los Angeles, Marin, Mendocino, Merced, Monterey, San Joaquin, San Luis Obispo, Santa Clara, Santa Cruz, Sonoma, Tulare
Hosts: Barley, oats and other grains, mixed feeds

Perimegatoma variegata Horn

Counties: Butte, Kern, Orange, Plumas, San Bernardino, San Luis Obispo, Sierra, Stanislaus
Hosts: Barley, mixed feeds, seed, wasp nests, wheat

Perimegatoma vespulae Milliron

Counties: El Dorado, Humboldt, Kern, Marin, Riverside, Sacramento, San Bernardino, San Joaquin, San Mateo, Santa Barbara, Santa Clara
Hosts: Beans, cobwebs, corn and other grains, mixed feeds

Perimegatoma spp.

Counties: Amador, Butte, Colusa, Fresno, Glenn, Imperial, Inyo, Kings, Lake, Mari-

posa, Modoc, Monterey, Nevada, Plumas, Riverside, Sacramento, San Luis Obispo, Santa Clara, Sierra, Sutter, Ventura, Yuba

Hosts: Austrian peas, barley, cottonseed meal, mixed feeds, mud dauber nests, oats, powdered dry eggs, pumpkin seed, rolled barley, wheat

Thylodrias contractus Motschulsky. Odd beetle

Counties: Fresno, Imperial, San Diego

Hosts: Breakfast cereals, candy, corn meal, fish food, seeds

Trogoderma glabrum (Herbst)

Counties: Fresno, Imperial, Kern, Kings, Los Angeles, Merced, Placer, Sacramento, San Joaquin, Yuba

Hosts: Barley, corn, mixed feeds, mud dauber nests, soybean meal, wheat

Trogoderma granarium Everts Khapra beetle

Counties: Alameda, Butte, Colusa, Fresno, Glenn, Imperial, Kern, Kings, Lake, Los Angeles, Madera, Napa, Riverside, San Bernardino, San Diego, San Francisco, Sutter, Tulare (*Note*: The only infested county at present is Fresno, and by the time this article is published the single infested property involved probably will have been fumigated.)

Hosts: Alfalfa seed, alfalfa hay, ant nests, barley, beans, beet seed, canary grass seed, clover seed, corn, corn meal, cotton seed, cottonseed meal, flax seed, macaroni, millet, milo, mixed feeds, oats, oriental poppy seed, peas, rice, rolled barley, rolled milo, sorghum seed, Sudan grass seed, sugar, sugar beet pulp, Swiss chard seed, tomato seed, vetch seed, walnut meats, watermelon seed, wheat

Trogoderma grassmani Beal

Counties: Butte, Glenn, Imperial, Kern, Kings, Los Angeles, Merced, Riverside, San Bernardino, San Diego, San Joaquin, Santa Clara

Hosts: Alfalfa seed, barley, beans, beet seed, candy, cottonseed, flax seed, ground barley, mixed feeds, onion seed, sorghum, spinach seed, Sudan grass seed, wheat

Trogoderma inclusum LeConte

Counties: Alameda, Butte, Colusa, Contra Costa, Fresno, Glenn, Imperial, Kern, Kings, Lake, Los Angeles, Madera, Marin, Mendocino, Merced, Placer, Riverside, San Bernardino, San Diego, San Francisco, San Joaquin, San Luis Obispo, Santa Clara, Shasta, Siskiyou, Solano, Sonoma, Stanislaus, Sutter, Tulare, Ventura, Yolo, Yuba.

Hosts: Alfalfa meal, alfalfa seed, barley, beans, beehives, breakfast cereals, broomcorn seed, burr clover seed, corn meal, cotton seed, cottonseed meal, dried prunes, fenugreek seed, melon seed, millet, milo, mixed feeds, mud dauber nests, oats, peas, rice, safflower seed, soda crackers, soybean meal, Sudan grass seed, sugar, sugar beet pulp, vetch, wasp nests, wheat, wheat bran, wild rice

Trogoderma ornatum Say

Counties: Alameda, Butte, Contra Costa, Fresno, Humboldt, Imperial, Inyo, Kern, Los Angeles, Merced, Monterey, Napa, Orange, Riverside, Sacramento, San Benito. San Bernardino, San Diego, San Joaquin, San Luis Obispo, San Mateo, Santa Barbara, Santa Clara, Santa Cruz, Sonoma, Ventura, Yolo

Hosts: Barley, beans, beehives, beet seed, broomcorn seed, cactus seed, cobwebs, corn, cottonseed meal, cottonseed meal cake, flower seed, garbanzos, garlic, grass seed, millet, mixed feeds, rolled barley, walnut meats, wasp nests, wheat, wild rice

Trogoderma parabile Beal

Counties: Alameda, Butte, Calaveras, Colusa, Contra Costa, El Dorado, Fresno, Glenn, Imperial, Inyo, Kern, Kings, Lake, Los Angeles, Madera, Merced, Modoc, Monterey, Placer, Plumas, Riverside, Sacramento, San Benito, San Bernardino, San Diego, San Joaquin, San Luis Obispo, San Mateo, Santa Barbara, Santa Clara, Santa Cruz, Shasta, Siskiyou, Sonoma, Stanislaus, Sutter, Tehama, Tulare, Ventura, Yolo, Yuba

Hosts: Alfalfa seed, almond meats, Austrian peas, barley, beans, beef cubes, beet seed, breakfast cereals, brome seed, burnet seed, candy, cantaloupe seed, chili pepper (dried), cobwebs, cookies, corn, corn meal, cotton seed, cucumber seed, Dallis grass seed, dandelion seed, date pollen, dehydrated chicken soup, dried peaches, egg noodles, eggplant seed, fescue seed, fish meal, flour, fudge mixes, garbanzos, hominy grits, Ladino clover seed, lettuce seed, macaroni, millet, milo, mixed feeds, mud dauber nests, oats, onion seed, peas, pepper seed, powdered dried milk, powdered pudding, raisins, rice, rice bran, rye, ryegrass seed, safflower seed, sesbania seed, soybeans, spaghetti, spices, spider egg masses, spinach

Heavy infestation of *Trogoderma prabile*, a relative of the khapra beetle, on cracked wheat. Kenneth L. Middleham photo.

seeds, squash seed, Sudan grass seed, sunflower seed, sweet corn seed, tomato seed, tortillas (dry), vetch seed, walnut meats, watermelon seed, wheat, wheatgrass seed, wild rice

Trogoderma simplex Jayne

COUNTIES: Alameda, Amador, Butte, Calaveras, Colusa, Contra Costa, Fresno, Glenn, Imperial, Inyo, Kern, Kings, Lake, Los Angeles, Madera, Mendocino, Merced, Modoc, Mono, Monterey, Nevada, Placer, Riverside, Sacramento, San Benito, San Bernardino, San Diego, San Joaquin, San Luis Obispo, Santa Barbara, Santa Clara, Santa Cruz, Sierra, Siskiyou, Sonoma, Stanislaus, Tulare, Tuolumne, Yolo, Yuba

HOSTS: Alfalfa seed, almond meats, almond hulls (crushed), barley, beans, beehives, beet seed, blood meal, breakfast cereals, cantaloupe seed, Cellotex, cobwebs, corn, corn meal, cotton seed, cottonseed hulls, cottonseed meal, date pollen, fescue seed, fish meal, flax seed, ground barley, lettuce seed, millet, milo, mixed feeds, mud dauber nests, oats, onion seed, popcorn, powdered dried eggs, powdered dried milk, raisins, rice, rice meal, rolled barley, rolled oats, ryegrass seed, safflower seed, sesame seed, sesbania seed, sorghum seed, soybean meal, squash seed, Sudan grass seed, sunflower seed, tomato seed, vetch seed, walnut meats, watermelon seed, wheat, wheat bran

Trogoderma sternale Jayne

COUNTIES: Alameda, Amador, Butte, Calaveras, Colusa, Contra Costa, Fresno, Glenn, Humboldt, Imperial, Inyo, Kern, Kings, Lake, Los Angeles, Madera, Mendocino, Merced, Monterey, Napa, Nevada, Placer, Riverside, Sacramento, San Benito, San Bernardino, San Diego, San Francisco, San Joaquin, San Luis Obispo, San Mateo, Santa Barbara, Santa Clara, Santa Cruz, Shasta, Siskiyou, Sonoma, Stanislaus, Sutter, Tehama, Tulare, Tuolumne, Ventura, Yolo, Yuba

HOSTS: Alfalfa seed, almond hulls, almond meats, bentgrass seed, barley, beans, beehives, beet seed, Bermuda grass seed, breakfast cereals, brome seed, cabbage seed, candy, cantaloupe seed, cauliflower seed, cayenne pepper (dried), Cellotex, chili pepper (dried), cobwebs, coriander seed, corn, corn meal, cotton seed, cottonseed hulls, cottonseed meal, cottonseed meal cake, cucumber seed, bluegrass seed, dried figs, eggplant seed, fescue seed, flax seed, flour, ground barley, ground corn, hay, kohlrabi seed, lettuce seed, linseed oil meal, macaroni, meat scraps (dried), millet, milo, mixed feeds, mud dauber nests, mustard seed, nasturtium seed, peanuts, peas, pecan nuts, pepper seed, powdered dried milk, prunes, pumpkin seed, raisins, rice, rolled barley, rolled oats, ryegrass seed, safflower seed, sesbania seed, soda crackers, snapdragon seed, sorghum, sour clover seed, spider egg masses, spinach seed, stock (flower) seed, Sudan grass seed, sugar beet pulp, sunflower seed, trefoil seed, vetch seed, walnut meats, wasp nests, wheat, wheat bran, wheatgrass seed, wool clothing

Erotylidae

Pharaxonotha kirschi Reitt. Mexican grain beetle

COUNTY: San Bernardino

HOSTS: Corn, ground grain, mixed feeds

Histeridae

Carcinops spp.

COUNTY: Kern

HOST: Milo

Carcinops quattuordecimstriata (Stephens)

COUNTIES: Los Angeles, San Bernardino, San Diego, Stanislaus, Ventura

Hosts: Corn meal, flour, grain, soda crackers

Dendrophilus punctatus (Herbst)

County: Riverside

Host: Grain

Saprinus spp.

Counties: Imperial, Los Angeles, Riverside, San Bernardino, San Diego, San Luis Obispo, Santa Barbara

Hosts: Corn and other grains, corn meal, corn cobs, mixed feeds

Lathridiidae

Enicmus minutus (L.)

Counties: Contra Costa, Kings, Merced, Monterey, San Bernardino, San Diego, San Luis Obispo, Santa Clara, Santa Cruz, Sonoma, Stanislaus, Tulare, Yolo

Hosts: Barley, dried figs, milo, oats, wheat

Enicmus suspectus Fall

Counties: Kings, San Diego

Host: Wheat

Enicmus spp.

Counties: Colusa, Glenn, Humboldt, Kings, Lake, Merced, San Diego, San Joaquin, San Luis Obispo, Santa Clara, Stanislaus

Hosts: Barley, corn, milo, walnut meats, wheat bran

Holoparamecus caularum (Aubé)

County: Orange

Host: Seed

Mycetophagidae

Litargus balteatus LeConte

Counties: Butte, Colusa, Imperial, Kings, Riverside, San Diego, San Joaquin, San Luis Obispo, Solano, Stanislaus

Hosts: Barley, milo, other grains, cotton seed, mixed feeds, flour

Mycetophagus quadriguttatus Müller

Counties: Fresno, Riverside, Santa Cruz, Tulare

Hosts: Barley, corn, mixed feeds, oats

Typhaea stercorea (L.) Hairy fungus beetle

Counties: Alameda, Butte, Colusa, Del Norte, Fresno, Imperial, Kern, Kings, Lake, Napa, Orange, Riverside, San Diego, San Joaquin, Santa Clara, Santa Cruz, Solano, Sonoma, Sutter, Tulare, Yolo

Hosts: Apple pomace, barley, beans, breakfast cereals, corn, cotton seed, cotton gin trash, flax seed, grain debris, milo, oats, onions, orange pomace, wheat

Nitidulidae

Carpophilus brevipennis (Blanchard)

County: Santa Clara

Host: Garlic

Carpophilus dimidiatus (F.) Corn sap beetle

Counties: Contra Costa, Fresno, Imperial, Kern, Kings, Orange, Sacramento, San Diego, Solano, Yuba

Hosts: Barley, corn, cotton gin trash, milo, mixed feeds, nectarines (in orchard), peaches (in orchard), peppers (green), onions, wheat

Carpophilus hemipterus (L.) Dried-fruit beetle

Counties: Butte, Fresno, Glenn, Imperial, Kern, Kings, Los Angeles, Madera, Orange, Riverside, San Diego, San Joaquin, San Luis Obispo, Santa Barbara, Santa Cruz, Tulare

Hosts: Barley, beans, corn, corn meal, cotton bolls, cotton gin trash, dates, flour, mixed feeds, onions, pineapples, walnuts, wheat, wheat bran

Carpophilus humeralis (F.)

Counties: Alameda, Fresno, Orange, Riverside, San Bernardino, San Diego, Solano, Tulare

Hosts: Cotton bolls, peanuts, pineapples

Glischrochilus sp.

County: Fresno

Host: Tomato seed

Haptoncus luteolus (Erichson)

Counties: Fresno, Riverside, Santa Barbara, Tulare

Hosts: Cotton bolls, dried peaches

Nitidula flavomaculata Rossi

Counties: Monterey, Orange

Hosts: Bones, fish meal, grain

Ostomatidae

Tenebroides mauritanicus (L.) Cadelle

Counties: Alameda, Amador, Butte, Colusa, Contra Costa, Fresno, Glenn, Imperial, Kern, Kings, Lake, Lassen, Merced, Modoc, Napa, Placer, Riverside, Sacramento, San Bernardino, San Diego, San Joaquin, San Luis Obispo, Santa Barbara, Santa Clara, Santa

Cruz, Shasta, Solano, Sonoma, Stanislaus, Sutter, Tehama, Tulare, Ventura, Yolo, Yuba

Hosts: Almond hulls, barley, beet pulp, corn, corn cobs, corn stalks, flour, milo, mixed feeds, rice, Sudan grass seed, wheat

Ptinidae

Gibbium psylloides (Czemp.)

Counties: Imperial, Orange, Riverside

Host: Mixed feeds

Mezium americanum (Laporte)

Counties: Fresno, Sacramento

Hosts: Melon seed, mixed feeds, wool carpet

Ptinus fur L. White-marked spider beetle

Counties: Butte, Humboldt, San Joaquin

Hosts: Corn and other grains, ground barley

Ptinus gandolphei Pic

Counties: Fresno, Kern, Tulare

Hosts: Cotton seed, mixed feeds

Ptinus hirtellus Sturm Brown spider beetle

Counties: Alameda, Butte, Calaveras, Colusa, Contra Costa, Del Norte, El Dorado, Fresno, Glenn, Humboldt, Kern, Kings, Lake, Los Angeles, Madera, Mendocino, Merced, Modoc, Monterey, Napa, Orange, Riverside, Sacramento, San Benito, San Bernardino, San Diego, San Joaquin, San Luis Obispo, Santa Barbara, Santa Clara, Santa Cruz, Shasta, Stanislaus, Sutter, Tehama, Tulare, Yolo

Hosts: Alfalfa seed, barley, beans, cobwebs, corn, corn meal, cotton seed, cottonseed meal, mixed feeds, Dallis grass seed, flour, ground barley, milo, oats, rice, soybean meal, spinach seeds, sunflower seeds, vetch seeds, wheat

Ptinus ocellus Brown Australian spider beetle

Counties: Alameda, Butte, Contra Costa, Humboldt, Kern, Los Angeles, Monterey, Placer, Riverside, San Benito, San Bernardino, San Luis Obispo, San Mateo, Santa Barbara, Santa Cruz, Solano, Sonoma, Stanislaus

Hosts: Alfalfa hay, barely, beet seed, corn meal, fish meal, lettuce seed, mixed feeds, nasturtium seed, oats, wheat

Ptinus villiger (Reitt.) Hairy spider beetle

County: Riverside

Host: Mixed feeds

Trigonogenius globulus Sol.

Counties: Alameda, Humboldt, Monterey, Napa, Orange, Riverside, San Benito, San Bernardino, San Diego, San Joaquin, San Luis Obispo, Santa Barbara, Santa Cruz, Sonoma, Ventura

Hosts: Barley, beans, beet seed, cottonseed meal, cottonseed meal cake and pellets, mixed feeds, liver meal, oats, wheat

Silvanidae

Ahasverus advena (Waltl.) Foreign grain beetle

Counties: Alameda, Butte, Colusa, Contra Costa, Del Norte, Kern, Kings, Napa, Orange, Placer, Riverside, Sacramento, San Bernardino, San Diego, Santa Clara, Santa Cruz, Stanislaus, Tulare, Yolo

Hosts: Apple pomace, barley, beans, corn, dead animal (dried), milo, mixed feeds, oats, orange pomace, safflower seed, stale cake

Oryzaephilus mercator (Fauvel) Merchant grain beetle

Counties: Butte, Santa Barbara, Stanislaus

Hosts: Copra meal, grains, safflower meal

Oryzaephilus surinamensis (L.) Saw-toothed grain beetle

Counties: Alameda, Butte, Colusa, Contra Costa, El Dorado, Fresno, Glenn, Humboldt, Imperial, Inyo, Kern, Kings, Lake, Madera, Merced, Monterey, Placer, Riverside, Sacramento, San Benito, San Bernardino, San Diego, San Francisco, San Joaquin, San Luis Obispo, San Mateo, Santa Barbara, Santa Cruz, Shasta, Siskiyou, Solano, Sonoma, Stanislaus, Sutter, Tulare, Ventura, Yolo, Yuba

Hosts: Alfalfa seed, almond meats, baking soda, barley, breakfast cereals, candy, corn, cornmeal, corn starch, flour, garbanzos, hay, milo, mixed feeds, oats, raisins, rice, safflower seed, peas, pecan meats, vetch seed, wheat, wheat bran

Silvanus planatus Germ.

County: Tulare

Host: Corn

Tenebrionidae

Alphitobius diaperinus (Panz.) Lesser mealworm

Counties: Contra Costa, Fresno, Kern, Kings, Los Angeles, Merced, Orange, Placer, Riverside, Sacramento, San Bernardino, San Diego, Santa Barbara, Santa Clara, Santa Cruz, Sonoma, Stanislaus, Tulare

Hosts: Barley, cotton seed, manure (stack), mixed feeds, poultry litter, wheat

The yellow mealworm on cracked wheat. Kenneth L. Middleham photo.

Alphitobius piceus (Oliv.) Black fungus beetle

COUNTIES: Fresno, Imperial, Kern, Orange, Santa Barbara, Stanislaus, Yolo

HOSTS: Cotton seed, mixed feeds, sugar beets, whole grains, wheat bran

Alphitophagus bifasciatus (Say) Two-banded fungus beetle

COUNTIES: Contra Costa, Glenn, Kern, Lake, Merced, Monterey, Orange, Riverside, San Joaquin, Santa Barbara, Santa Cruz, Sutter, Tuolumne

Hosts: Barley, beans, garbanzos, milo, mixed feeds, rice, wheat

Blapstinus spp.

Counties: Fresno, Kern, Kings, Orange, Plumas, Riverside, San Diego, San Joaquin, Santa Barbara

Hosts: Barley and other grains, cotton seed, lima beans, mixed feeds

Cnemaplatia sericea Horn

Counties: Colusa, Kings, Merced, Santa Clara, Tulare

Hosts: Barley, cotton gin trash, rice and other grains

Conibus seriatus Lec.

County: Fresno

Host: Grain

Coniontus sp.

County: Orange

Host: Seed

Gnathocerus cornutus (F.) Broad-horned flour beetle

Counties: Alameda, Contra Costa, Kern, Kings, Napa, Orange, Plumas, Riverside, San Diego, San Joaquin, San Luis Obispo, Santa Barbara, Santa Clara, Santa Cruz, Solano, Sonoma

Hosts: Beet seed, corn meal, cottonseed meal cake, cotton gin trash, flour, oats and other grains, mixed feeds

Gnathocerus maxillosus (F.) Slender-horned flour beetle

Counties: Orange, San Joaquin, Tulare

Host: Mixed feeds

Latheticus oryzae Waterh. Long-headed flour beetle

Counties: Butte, Colusa, Fresno, Imperial, Kings, Merced, Orange, Riverside, San Bernardino, San Diego, Solano, Tulare, Yolo

Hosts: Barley, flour, ground cereals, milo, mixed feeds, raisins, rolled barley, wheat

Palorus ratzeburgi (Wissm.) Small-eyed flour beetle

County: Fresno

Hosts: (None listed)

Palorus subdepressus (Woll.) Depressed flour beetle

Counties: Fresno, Orange

Hosts: Flax seed, grain, mixed feeds

Tenebrio molitor L. Yellow mealworm

Counties: Alameda, Butte, Contra Costa, Fresno, Kings, Los Angeles, Placer, San Bernardino, Santa Barbara, Stanislaus, Tuolumne, Yolo

Hosts: Corn cobs, cotton gin trash, oats and other grains, corn meal, mixed feeds, potatoes, wheat bran

Tenebrio obscurus F. Dark mealworm

Counties: Alameda, Butte, Fresno, Kings, Lassen, Modoc, San Diego, Santa Barbara, Santa Clara, Santa Cruz, Shasta, Stanislaus, Sutter, Tehama, Tulare, Ventura, Yolo

Hosts: Barley and other grains, beet pulp, cotton gin trash, cottonseed meal, flour, mixed feeds

Tribolium castaneum (Hbst.) Red flour beetle

Counties: Alameda, Butte, Colusa, Contra Costa, Del Norte, Fresno, Humboldt, Imperial, Kern, Kings, Los Angeles, Madera, Mendocino, Merced, Napa, Placer, Riverside, Sacramento, San Benito, San Bernardino, San Diego, San Francisco, San Luis Obispo, San Mateo, Santa Barbara, Santa Clara, Santa Cruz, Shasta, Solano, Stanislaus, Sutter, Tehama, Tulare, Tuolumne, Ventura, Yolo

Hosts: Alfalfa seed, almonds, barley, copra meal, cotton gin trash, cotton seed, cottonseed meal, flax seed, flour, millet, milo, mixed feeds, oats, peas, raisins, rice, rye, safflower seed, wheat, wheat bran

Tribolium confusum Duv. Confused flour beetle

Counties: Alameda, Butte, Colusa, Fresno, Glenn, Humboldt, Imperial, Inyo, Kern, Kings, Lake, Merced, Napa, Placer, Riverside, Sacramento, San Bernardino, San Diego, San Joaquin, Santa Barbara, Santa Clara, Santa Cruz, Solano, Stanislaus, Sutter, Tehama, Tulare, Ventura, Yolo, Yuba

Hosts: Almond meats, barley, beet pulp, breakfast cereals, corn, cotton seed, cottonseed hulls, cottonseed meal, mixed feeds, oats, powdered milk, rice, safflower meal, vetch seed, walnut meats, wheat, wheat bran

Tribolium destructor Uyttenb.

Counties: Alameda, San Diego, Santa Barbara

Hosts: Flour, grains, mixed feeds

Ulus spp.
COUNTY: Alameda
HOST: Cantaloupe seed

Psocoptera

Liposcelidae

Liposcelis divinatorius (Müll.) Book louse
COUNTIES: Contra Costa, Fresno, Kings, Madera, Merced, San Bernardino, San Diego, Santa Barbara, Santa Cruz, Ventura
HOSTS: Barley and other grains, cottonseed hulls, mixed feeds, rice hulls

Diptera

Piophilidae

Piophila casei (L.) Cheese skipper
COUNTY: San Bernardino
HOST: Corn meal

Hymenoptera

Eurytomidae

Bruchophagus gibbus (Boheman) Clover seed chalcid
COUNTIES: Imperial, Madera
HOSTS: Alfalfa seed, grain

Formicidae

Solenopsis molesta var. *validiuscula* Emery
COUNTY: Kings
HOSTS: Grain, flour

Solenopsis xyloni McCook Southern fire ant
COUNTIES: Kern, Kings, Los Angeles, San Bernardino
HOSTS: Barley and other grains, pecans

Lepidoptera

Cosmopterygidae

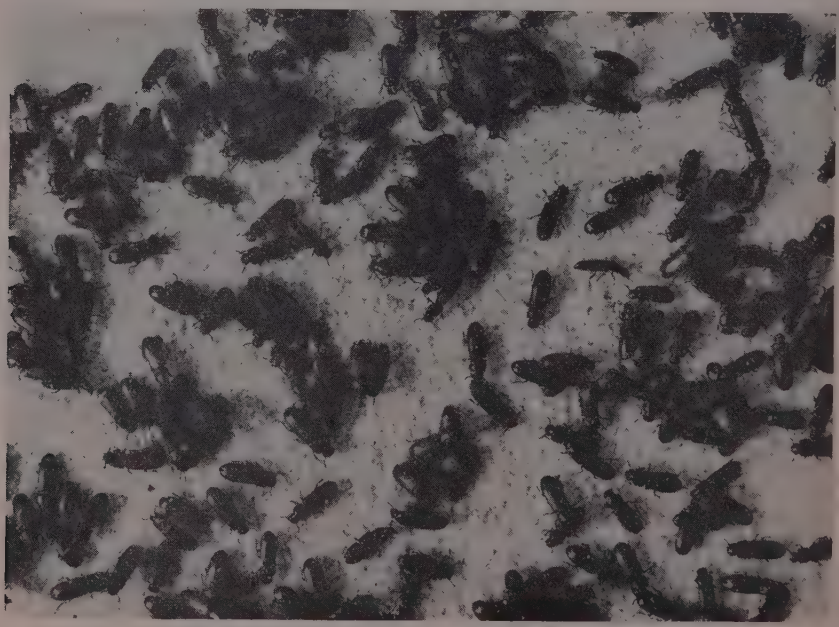
Pyroderces rileyi (Wals.) Pink corn worm
COUNTIES: Imperial, Orange, Santa Cruz
HOST: Milo

Galleriidae

Achroia grisella (F.) Lesser wax moth
COUNTIES: Monterey, San Diego
HOST: Beeswax

Aphomia gularis (Zell.) Dried prune moth
COUNTY: Santa Clara
HOST: Dried fruit

Galleria mellonella (L.) Greater wax moth
COUNTY: San Diego
HOST: Beeswax



A heavy infestation of the confused flour beetle in flour. Kenneth L. Middleham photo.

Gelechiidae

Gnorimoschema operculella (Zell.) Potato tuberworm

COUNTIES: Fresno, Madera, Monterey, Riverside, Santa Barbara, Tulare

HOST: Potatoes (in storage)

Sitotroga cerealella (Oliv.) Angoumois grain moth

COUNTIES: Fresno, Kings, Los Angeles, Madera, Riverside, Sacramento, San Diego, San Francisco, San Mateo, Santa Barbara, Tulare, Yolo

HOSTS: Barley, corn, corn meal, flour, milo, mixed feeds, vetch seed, wheat

Oecophoridae

Endrosis lactella (Schiff.) White-shouldered house moth

COUNTIES: Alameda, Contra Costa, Del Norte, Lake, Los Angeles, Modoc, Napa, Plumas, Santa Barbara, Santa Clara, Santa Cruz, Sonoma

HOSTS: Corn and other grain, mixed feeds, wheat bran

Hofmannophila pseudospretella (Staint.) Brown house moth

COUNTIES: Alameda, Contra Costa, Del Norte, Humboldt, Monterey, Orange, San Joaquin, Santa Barbara, Santa Cruz, Siskiyou, Solano

HOSTS: Cantaloupe seed, celery seed, fish meal, grain, mixed feeds

Olethreutidae

Carpocapsa pomonella (L.) Codling moth

COUNTIES: Butte, San Joaquin, Shasta, Sutter, Ventura

HOST: Walnuts

Melissopus latiferreanus (Wlsm.) Filbertworm

COUNTIES: Butte, Glenn, Lake, Riverside, San Diego, San Joaquin, San Luis Obispo, Stanislaus, Sutter, Tulare

HOSTS: Almonds, filbert nuts, hazel nuts, pecans, walnuts

Phycitidae

Anagasta kühniella (Zell.) Mediterranean flour moth

COUNTIES: Alameda, Amador, Butte, Calaveras, Colusa, Contra Costa, Del Norte, Fresno, Humboldt, Imperial, Kern, Kings, Lake, Los Angeles, Merced, Monterey, Napa Orange, Placer, Riverside, Sacramento, San Bernardino, San Diego, San Joaquin, San Luis Obispo, San Mateo, Santa Barbara, Santa Clara, Santa Cruz, Solano, Sonoma, Stanislaus, Tehama, Tulare, Ventura, Yolo, Yuba

HOSTS: Acorns, almond hulls, alfalfa hay (baled), barley, corn, corn meal, cotton seed, cottonseed meal, flour, garlic, milo, mixed feeds, oats, rice, sunflower seed, vetch seed, walnut meats, wheat, wheat bran, wheat germ

Ephestia cautella (Walker) Almond moth

COUNTIES: Madera, San Francisco, Tulare

HOSTS: Candy, grain

Ephestia elutella (Hbn.) Tobacco moth

COUNTIES: Alameda, Colusa, Fresno, Glenn, Kings, Monterey, Sacramento, San Diego, Santa Barbara, Tulare

HOST: Barley, broomcorn seed, cotton seed, cottonseed meal, dried fruit, garlic, mixed feeds, oats, peas

Ephestia figulilella Greg. Raisin moth

COUNTIES: Alameda, Contra Costa, Fresno, Imperial, Los Angeles, Merced, Riverside, San Benito, San Bernardino, Solano, Sutter

HOSTS: Almonds, candy, dried fruit, milo, mixed feeds, soda crackers

Etiella zinckenella (Treit.) Lima-bean pod borer

COUNTY: San Joaquin

HOST: Beans

Paramyelois transitella (Walker) Navel orangeworm

COUNTIES: Alameda, Butte, Colusa, Contra Costa, Fresno, Imperial, Kern, Merced, Mono, Orange, Riverside, Sacramento, San Bernardino, San Diego, San Joaquin, San Luis Obispo, Santa Clara, Shasta, Siskiyou, Stanislaus, Sutter, Tehama, Tulare, Ventura, Yolo

HOSTS: Almonds, almond hulls, apples, dates, dried peaches, orange fruit, quince fruit, walnuts

Plodia interpunctella (Hbn.) Indian-meal moth

COUNTIES: Alameda, Butte, Colusa, Contra Costa, Del Norte, Fresno, Glenn, Humboldt, Imperial, Kern, Kings, Madera, Merced, Mono, Monterey, Napa, Placer, Riverside, Sacramento, San Bernardino, San

Diego, San Francisco, San Joaquin, San Mateo, Santa Barbara, Santa Clara, Santa Cruz, Shasta, Siskiyou, Solano, Sonoma, Stanislaus, Sutter, Tehama, Tulare, Ventura, Yolo, Yuba

HOSTS: Alfalfa hay, almonds, almond hulls, almond hull meal, barley, beans, beehives, bread, breakfast cereals, canary grass seed, candy, cantaloupe seed, chili pepper, (ground), copra, corn, corn meal, cotton seed, cottonseed meal cake, dried prunes. garlic, iris rhizomes, lettuce seed, meat scraps (dried), millet, milo, mixed feeds, oats, orange pulp, peanuts, peas, pecans, pepper seed, popcorn, pumpkin seed, raisins, rice, rice hulls, rolled barley, rye, safflower seed, soybeans, sugar beet pulp, sunflower seed, vetch seed, walnuts, watermelon seed, wheat, wheat germ

Vitula edmandsae serratilineella Rag. Dried-fruit moth

COUNTIES: Napa, Santa Clara
HOSTS: Dried fruit, beehives

Pyralididae

Aglossa caprealis (Hbn.) Murky meal caterpillar

COUNTIES: Orange, Sacramento, San Diego, San Joaquin
HOSTS: Beans, flour

Pyralis farinalis (L.) Meal moth

COUNTIES: Alameda, Butte, Del Norte, Fresno, Humboldt, Kern, Kings, Lake, Los Angeles, Merced, Napa, Orange, Placer, Riverside, Sacramento, San Bernardino, San Diego, San Joaquin, San Mateo, Santa Barbara, Santa Clara, Santa Cruz, Solano, Stanislaus, Sutter, Ventura

HOSTS: Almond hulls, barley, beans, cotton gin trash, cotton seed, corn, gladiolus corms, hyacinth bulbs, oats, mixed feeds, sunflower seed, tulip bulbs, wheat, wheat bran

Tineidae

Acedes fuscipunctella (Haw.) Brown-dotted clothes moth

COUNTIES: Fresno, Kern, Los Angeles, Orange, Riverside, Sacramento, San Bernardino, San Diego, Tulare
HOSTS: Barley and other grains, mixed feeds

Haplotinea ditella (Pierce and Metcalfe)

COUNTY: Los Angeles (*Note:* In shipment from Idaho, one collection; species not definitely established.)
HOST: Wheat

Lindera tessellatella Blanchard

COUNTY: Los Angeles
HOST: Grain

Nemapogon granella (L.) European grain moth

COUNTY: Santa Clara
HOST: Dried fruit

Paraneura simulella Dietz

COUNTY: Santa Clara
HOST: Mixed feeds

Setomorpha rutella Zell.

COUNTY: Kings
HOST: Corn meal

Tinea pellionella (L.) Casemaking clothes moth

COUNTIES: Glenn, San Diego
HOST: Fish meal

Thysanura

Lepismatidae

Ctenolepisma quadriseriata (Pack.) Silverfish

COUNTIES: Colusa, Placer, Santa Clara
HOST: Mixed feeds

Thermobia domestica (Pack.) Firebrat

COUNTY: Stanislaus
HOST: Mixed feeds

PARASITES AND PREDATORS OF STORAGE PESTS

Arachnida

Acarina

Cheyletidae

Acaropsis sp.

Phytoseiidae

Typhlodromus sp.

Pseudoscorpionida

Insecta (Hexapoda)

Diptera

Omphralidae

Omphrale fenestralis (L.)

Hemiptera

Anthocoridae

Anthocoris sp., *Lyctocoris campestris* (F.), *Orius tristicolor* (White)

Hymenoptera

Braconidae

Bracon hebetor Say

Pteromalidae

Anisopteromalus calandrae (Howard), *Lariophagus distinguendus* (Foerster)

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Allen, Paul, and E. G. Linsley. 1954. Proceedings Pacific Coast Entomological Society. Pan-Pacific Ent. 30: 89-90.

Doane, R. W. 1918. Some problems in the control of insects in stored foods in California. Jour. Econ. Ent. *11*: 313-319.

Linsley, E. G., and A. E. Michelbacher. 1943. A report on insect infestation of stored grain in California. Jour. Econ. Ent. 36: 829-831.

Mackie, D. B., and W. B. Carter. 1937. Pest control in rural warehouses and suggested improvements. Mo. Bull. Calif. Dept. Agr. 26: 275-293.

REVISION OF IMPORTANT ENTOMOLOGICAL REFERENCE BOOK

Professor E. O. Essig's book on "Insects of Western North America" has come out in a new 1958 revision under the title of "Insects and Mites of Western North America."

The expansion of pages to the number of 15 is taken up in the index section, leaving most of the subject matter in the same pagination area as before.

The chief revisions are to bring informaon control methods up to date, considering the many new pesticides. There are some new footnote references and illustrations, particularly of modern equipment, and a number of paragraphs devoted to additional insects.

This book will continue to serve as a basic reference source for those engaged in regulatory work involving insect pests of agriculture. Macmillan is the publisher.

W. C. Jacobsen

RESULTS OF FRESH PEACH MARKETING SURVEY RELEASED

The Bureau of Markets has published Marketing Survey Report No. 15, "Increasing the Sale of Fresh Peaches in California." Undertaken on request of the California Fresh Peach Advisory Board and on behalf of the California fresh peach industry, the survey was aimed at finding new opportunities for industry promotion of fresh peaches in this State. The survey was conducted and the report prepared by Walter J. Englund, marketing economist.

Supporting the findings, conclusions and recommendations of the 93-page report are 21 charts and 31 tables. Major subject headings are "consumer demand characteristics," "retail supply characteristics" and "retailer services."

Copies of the report may be obtained free of charge upon request to the Bureau of Markets, California Department of Agriculture, 1220 N Street, Sacramento 14, California.

RANKING OF CALIFORNIA'S PRINCIPAL CROPS AND LIVESTOCK—1957

Prepared by California Crop and Livestock Reporting Service, Sacramento, California
August 15, 1958

Crops	Rank in production among states 1957	Percent of national production 1957
Field Crops:		
Alfalfa seed	1	53.1
Alsike clover	4	13.0
Barley	1	18.1
Beans, dry	2	22.8
Corn, field	25	0.5
Cotton lint	2	13.6
Flaxseed	4	5.0
Grain sorghums	8	2.2
Hay, all	6	5.6
Hops	2	17.0
Ladino clover seed	1	90.0
Oats	26	0.6
Peas, dry field	5	2.2
Potatoes	3	13.1
Potatoes, sweet	7	5.4
Rice	4	21.5
Sudan Grass seed	2	26.9
Sugar beets	1	27.5
Vetch seed, all	1	27.2
Wheat, all	23	0.7
Fruit Crops:		
Almonds	1	100.0
Apples, comm.	4	7.5
Apricots	1	88.8
Avocados (1956-57)	1	72.3
Cherries, sweet	1	34.7
Dates	1	98.5[1]
Figs, dried	1	100.0
Grapefruit (1956-57)	3	5.4
Grapes	1	91.6
Lemons (1956-57)	1	98.8[1]
Olives	1	100.0
Oranges (1956-57)	2	27.2
Peaches, all	1	56.3
Pears, all	1	55.0
Plums	1	91.7
Fruit Crops:—Continued		
Prunes, dried	1	98.2
Walnuts	1	92.1
Vegetables:[2]		
Artichokes	1	100.0
Asparagus	1	52.2
Beans, green lima	1	41.9
Beans, snap	4	9.2
Broccoli	1	61.2
Brussels sprouts	1	90.0
Cabbage	5	10.2
Cantaloupes	1	52.9
Carrots	1	41.6
Cauliflower	1	38.9
Celery	1	59.7
Cucumbers	3	13.1
Honeydew melons	1	81.5
Lettuce	1	60.6
Onions	2	16.5
Peas, green	7	4.2
Spinach	1	28.4
Strawberries	1	41.1
Tomatoes	1	53.6
Watermelons	4	9.5
Livestock and Poultry:		
Broilers	11	3.0
Cattle and calves	8	4.2
Chickens (farm)	2	5.7
Eggs, (chicken)	2	7.6
Hogs	26	0.5
Honey	1	9.2
Milk production	4	6.1
Sheep and lambs	2	7.1
Turkeys	1	19.9
Wool	3	7.5

[1] Percent of national production in 1954 as reported by 1954 Census of Agriculture. More recent estimates not available for states other than California.
[2] Based on preliminary estimates issued December, 1957.

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